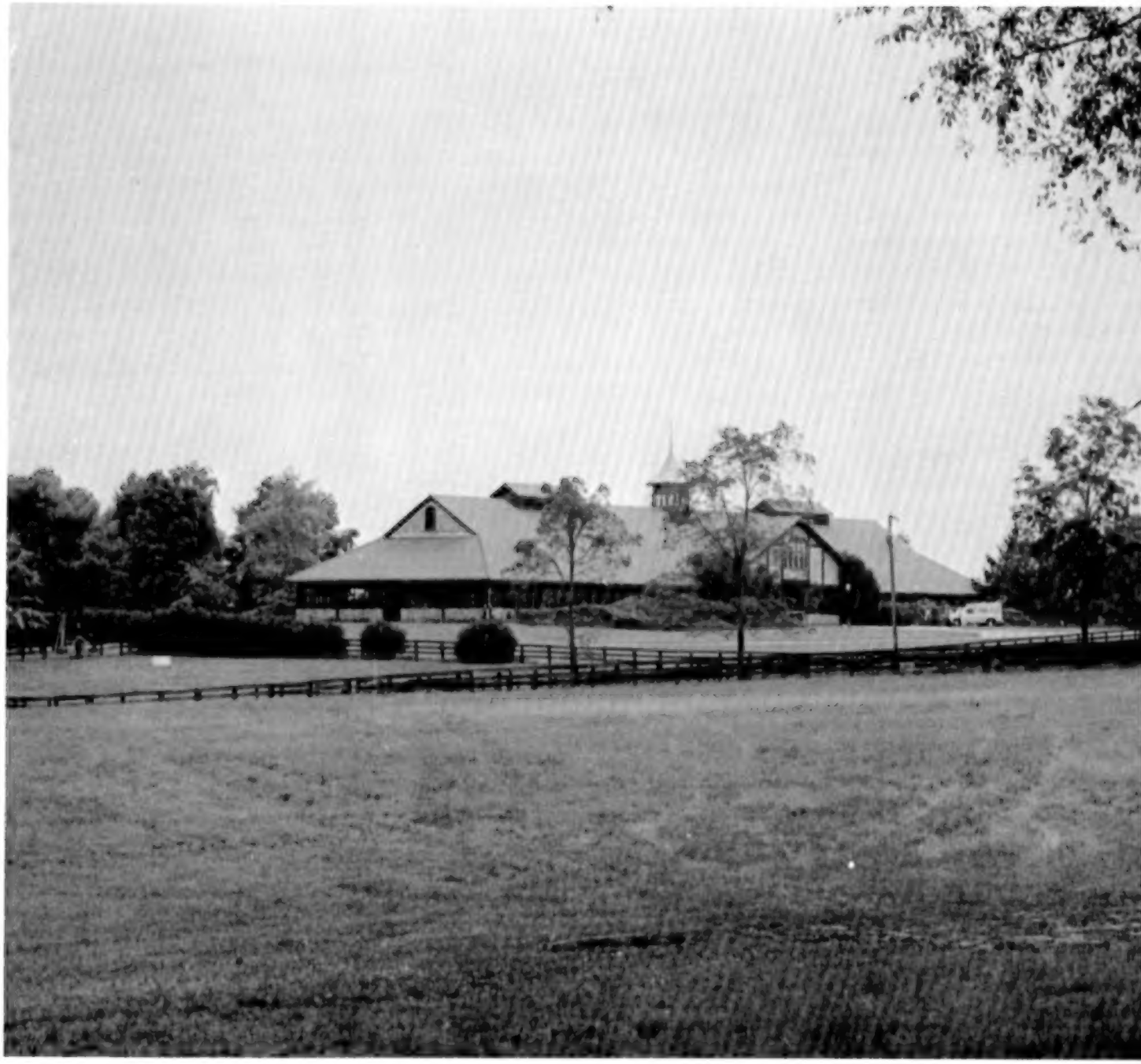
United States Department of Agriculture

Soil Conservation Service

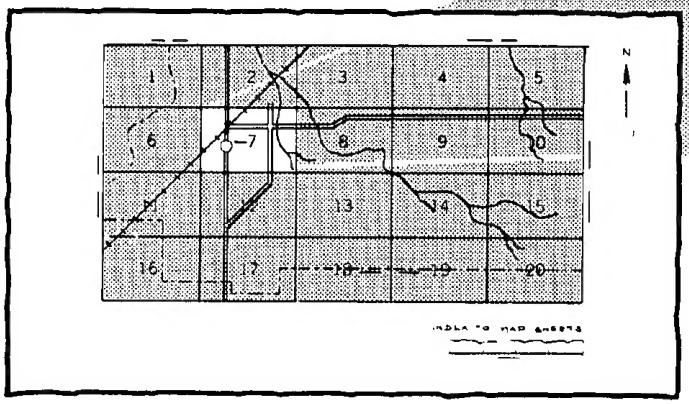
In Cooperation with Kentucky Department for Natural Resources and Environmental Protection and Kentucky Agricultural Experiment Station

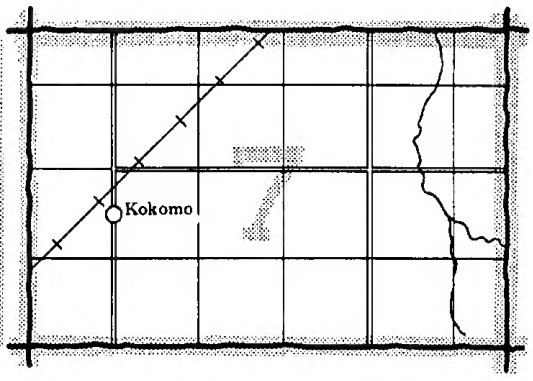
Soil Survey of Bourbon and Nicholas Counties Kentucky



HOW TO USE

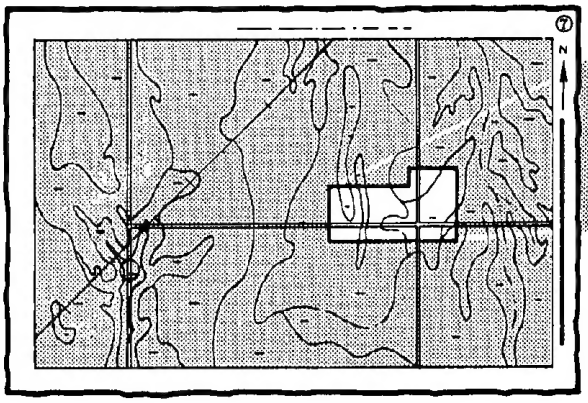
1. Locate your area of interest on the "Index to Map Sheets"

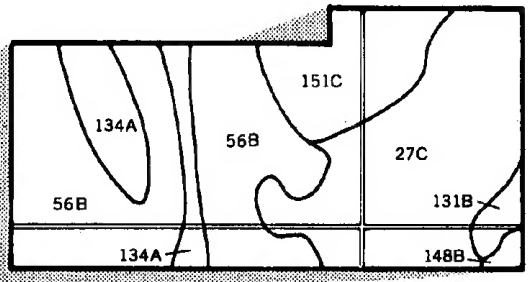




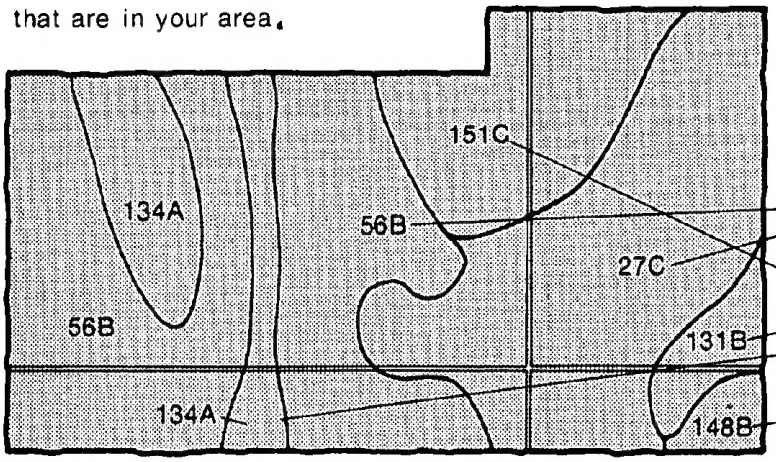
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.

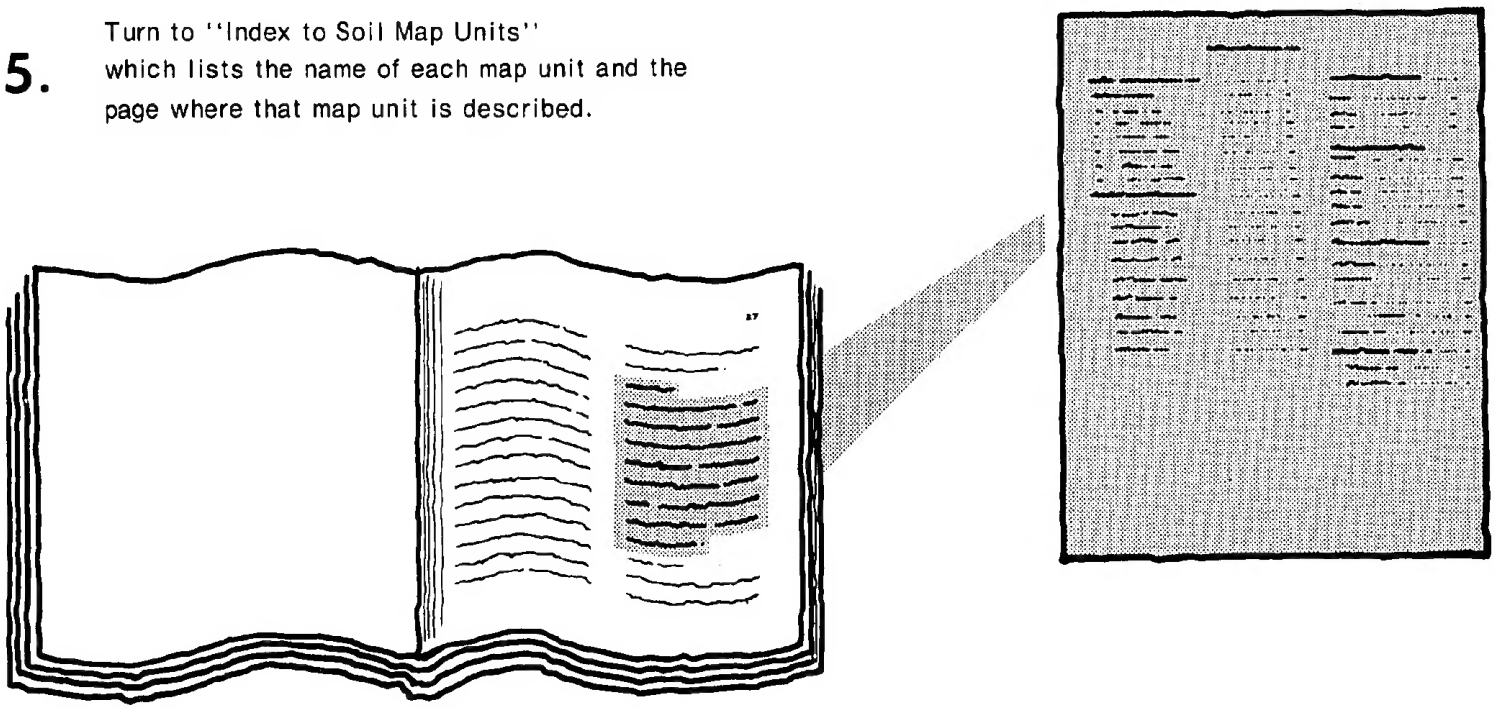


Symbols

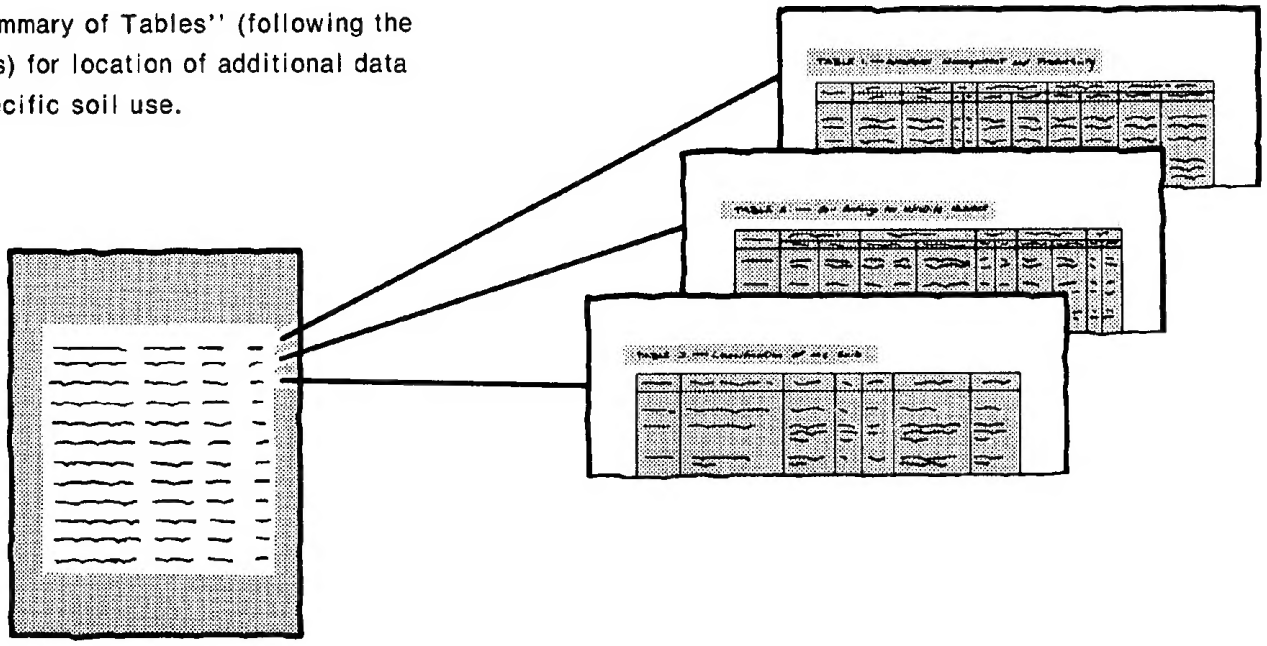
- 27C
- 56B
- 131B
- 134A
- 148B
- 151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1968-1977. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service, the Kentucky Department for Natural Resources and Environmental Protection, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Bourbon and Nicholas Counties Conservation Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Pasture and horse training barn in an area of Lowell silt loam, 2 to 6 percent slopes.

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soil series

Issued October 1982

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foreword

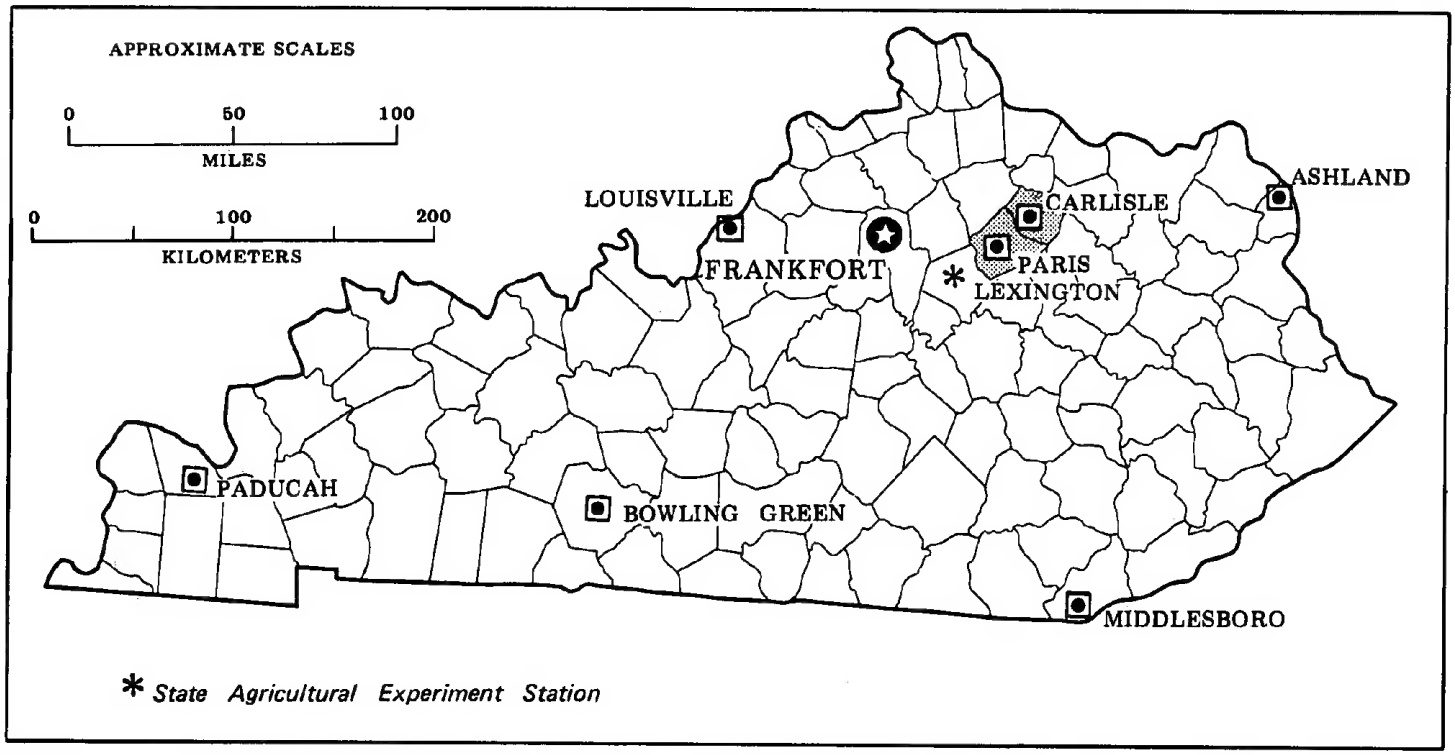
This soil survey contains information that can be used in land-planning programs in Bourbon and Nicholas Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Glen E. Murray
State Conservationist
Soil Conservation Service



Location of Bourbon and Nicholas Counties in Kentucky.

soil survey of Bourbon and Nicholas Counties, Kentucky

By Alfred J. Richardson, Rudy Forsythe, and Hubert B. Odor,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Kentucky Department for Natural Resources and Environmental Protection
and Kentucky Agricultural Experiment Station

BOURBON and NICHOLAS COUNTIES are in the Bluegrass Physiographic Region. Bourbon County is in the central part of Kentucky. Paris, the county seat, has a population of about 7,300. The population of the county is about 18,700 (*4*). Bourbon County has a total area of 192,000 acres, or 300 square miles. The topography is dominantly undulating to rolling and hilly and is dissected by many small streams. Elevation ranges from about 725 to 1,040 feet and averages 880 feet (*5*).

Nicholas County is in the north-central part of Kentucky. Carlisle, the county seat, has a population of about 1,629. The population of the county is about 6,800. Nicholas County has a total area of 130,560 acres, or 204 square miles. It is dominantly rolling to steep and is dissected by many small streams. The Licking River is the largest stream. It is on the northeastern boundary. Elevation ranges from about 590 to 1,065 feet (*5*).

general nature of the survey area

This section gives general information about the survey area. It discusses climate; physiography, geology, relief, and drainage; water resources; farming; and the history and settlement of the area.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Bourbon and Nicholas Counties, summers are hot and winters are moderately cold. Rains are fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Cynthiana, Kentucky, for the period 1952 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 32 degrees F, and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred at Cynthiana on January 28, 1963, is -34 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 27, 1952, is 105 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, about 24 inches, or nearly 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 4.17 inches at Cynthiana on September 1, 1965. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 18 inches. The greatest snow depth at any one time during the period of record

was 18 inches. On the average, 8 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

physiography, geology, relief, and drainage

Bourbon County is located mainly in the Inner Bluegrass Physiographic Region of Kentucky. The topography for the most part is smoothly undulating to rolling uplands, but there are steep hills east of North Middletown and along the major streams in the eastern and northern parts of the county. The county is drained by the South Fork of the Licking River and its tributaries.

The soils on uplands formed in material that derived from sedimentary rock of the Ordovician period (*5*). The soils in the central and western parts of the county are underlain by nearly level, thick-bedded limestone of the Lexington Formation (fig. 1). Soils in most other parts of the county are underlain by thin-bedded limestone of the Cynthiana Formation. In an area east of North Middletown, in the hills of the Bluegrass Physiographic Region, the soils are underlain by thin-bedded limestone, siltstone, and calcareous shale of the Kope and Clays Ferry Formation. That area is higher in elevation than other parts of the county.

Nicholas County is dominantly in the hills of the Bluegrass Physiographic Region. The topography is hilly. Long, narrow ridges and steep hillsides are dissected by many steep, V-shaped drainageways. Eden soils, by far, are the dominant soils. They are on the narrow ridges and hillsides. The Eden soils are underlain by nearly level, thin-bedded limestone, siltstone, and calcareous shale.

The western and southern parts of the county are mostly in the Outer Bluegrass Physiographic Region. The soils there are undulating to rolling and steep. They are underlain by nearly level bedded limestone interbedded with shale or siltstone and shale. Faywood, Cynthiana, and Eden soils are dominant.

In a small area in the Inner Bluegrass Physiographic Region south of Headquarters and near the Bourbon County line, the soils are undulating to hilly and are underlain by nearly level bedded limestone interbedded with shale. Lowell, Faywood, and Maury soils are the dominant soils.

The Licking River runs along the northeastern boundary of Nicholas County adjacent to Robertson and Fleming Counties. The soils on the broad terraces and flood plains along the river formed in alluvium. Flooding is common along most streams.

Figure 1.—Massive limestone underlies McAfee soils.

water resources

The areas west and south of Paris in Bourbon County have well water. Townsend, Cooper, Stoner, Houston, Green, and Strodes Creeks and the South Licking River drain those areas. There are several private lakes, farm ponds, and springs in that part of Bourbon County. Each farm has its own water system, except in the vicinity of Centerville and in an area along the Lexington-Paris Road. Those areas are serviced by public water lines. The city of Paris gets its water from Stoner Creek. Millersburg and North Middletown have small local water systems. The streams that are a source of water are small, and severe drought can endanger the water supply. There are several wells in this part of the county, but the water is generally hard, salty, or high in hydrogen

sulfide. These wells produce 100 to more than 500 gallons of water per day (*11*).

Areas north and east of Paris have few successful wells. The farm ponds and reservoirs are generally small, and many leak and go dry in long periods of drought. The limestone bedrock in some of these areas is cavernous, and sinkholes are on the surface. Cisterns are used to store water for domestic and livestock use.

Nicholas County is dominantly hilly and dissected by many small streams and steep valleys. Hinkston Creek divides Bourbon and Nicholas Counties on the southwest and south. The Licking River, which is the largest stream in the county, is on the northern boundary adjacent to Robertson County and on the eastern boundary adjacent to Fleming County. Carlisle has two small reservoirs that supply the town's water. Carnico Lake, which has a surface area of about 70 acres, is used mainly for recreation. The hilly area of Nicholas County is a poor risk for good wells, but there are some good wells along the larger streams. Many small ponds on ridgetops leak and go dry during long periods of drought. Good springs are also scarce.

farming

Bourbon and Nicholas Counties are dominantly agricultural. In 1974, according to the Census of Agriculture of that year (*10*), there were about 945 farms in Bourbon County, and the average size of a farm was 197 acres. Farms took up 97 percent of the land in the county. In 1974, there were 698 farms in Nicholas County, and the average size of a farm was 162 acres. Farms took up 86.5 percent of Nicholas County.

In Bourbon County, the income from livestock is slightly larger than that from crops, but in Nicholas County more than 60 percent of farm income is derived from crops (*10*). Tobacco, corn, soybeans, small grain, hay, and pasture are the main crops. The livestock consists of horses, beef cattle, sheep, and a small number of dairy cattle. Thoroughbred race horse production is a big business in Bourbon County and in parts of Nicholas County.

history and settlement

Before 1776, Kentucky was a part of Fincastle County, Virginia. In 1776, the Virginia Legislature divided Fincastle County and called one part of the area Kentucky County. In 1780, Kentucky County was divided into Jefferson, Lincoln, and Fayette Counties. In 1785, the northeastern part of Fayette County became Bourbon County. It extended on the northeast to what is now Maysville on the Ohio River. In 1792, Kentucky became a state, and Bourbon County was one of the nine counties that made up the state.

The first settlement in Bourbon County was called Hopewell. It was an important rest stop between Lexington and Limestone (now Maysville). There were some very good springs at that site. Hopewell was later called Bourbontown by the settlers, who were of French ancestry. In 1790, Bourbontown was renamed Paris. The first turnpike in the state connected Lexington, Paris, and Maysville.

Whiskey and tobacco were important commodities in early commerce. They were taken to New Orleans by way of the Ohio River.

Nicholas County was formed in 1799 from parts of Bourbon and Mason Counties. Nicholas County contributed 25,000 acres to the making of Robertson County in 1867 (*6*).

Blue Lick Springs was discovered by a survey party in 1789. It was an important salt-producing site for many years. By 1845, it had become an important health resort, and there were hotel accommodations for about 600 people. The water was bottled and shipped to most of the states and several foreign countries. The main hotel burned in 1862 and was never rebuilt (*6*).

The first county seat was Blue Lick Springs, on the main road between Lexington and Maysville. The county seat was relocated several times before 1816, when Carlisle was chosen as the permanent county seat.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results,

records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. In the descriptions that follow, the suitability of the soils in each map unit is given for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas*. Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

descriptions of the soils in Bourbon County

1. Lowell-Faywood

Gently sloping to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping soils on long, moderately broad to broad ridges and sloping to moderately steep soils on hillsides that are dissected by many small streams and drainageways. The moderately steep soils are near streams and drainageways. The major soils formed in material that weathered from limestone and interbedded shale. Soils that formed in alluvium are in long, narrow areas along streams and drainageways.

This map unit makes up about 21 percent of Bourbon County. About 60 percent of the map unit is Lowell soils, 18 percent is Faywood soils, and 22 percent is minor soils.

Lowell soils are on broad ridges and upper side slopes. Faywood soils are on hillsides below Lowell soils. Faywood soils have a silt loam to silty clay loam surface layer, and Lowell soils have a silt loam surface layer. Both of these soils have a clayey subsoil that is moderately slow or slow in permeability. Lowell soils are deep to bedrock, and Faywood soils are moderately deep.

The minor soils are Lowell Variant, Nicholson, Maury, McAfee, Fairmount, and Cynthiana soils on uplands, Lawrence and Otwell soils on stream terraces, and Nolin, Lindside, Newark, and Dunning soils on flood plains.

The soils making up this map unit are used mainly for pasture, hay, and cultivated crops. In a few steep areas along roads and streams, the soils remain in woodland.

The soils are suited to cultivated farm crops, but measures to control erosion are necessary. The main limitations are steepness of slopes, the risk of erosion, and, in Faywood soils, limited depth for root growth. The soils are suited to pasture and hay crops.

The soils are suited to specialty crops. The deep, well drained Lowell soils are best suited to vegetable, nursery, and fruit crops. The clayey subsoil restricts growth of root crops. Control of erosion is difficult where the soils are sloping or moderately steep.

The soils are suited to use as woodland. The hazard of erosion, equipment limitations, and control of competing plants are the main concerns in management.

The soils are suited to most urban and intensive recreation uses. The moderately slow or slow permeability of the clayey subsoil, the moderate depth of Faywood soils to bedrock, and the steepness of slopes are the main limitations. The broad areas of gently sloping Lowell soils are best suited to urban and intensive recreation uses.

2. Maury-McAfee-Lowell

Nearly level to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of nearly level to gently sloping soils on long, broad ridges and sloping to moderately steep soils in moderately broad to narrow areas around sinkholes and along drainageways. The moderately steep soils are near streams and drainageways. Most areas of this unit are drained by streams, and some areas are drained by small limestone sinkholes. Karst topography and sinkholes are common. The major soils formed in material that weathered mainly from phosphatic limestone. Soils that formed in alluvium are in long, narrow areas along streams and drainageways.

This map unit (fig. 2) makes up about 28 percent of Bourbon County. About 49 percent of the map unit is Maury soils, 24 percent is McAfee soils, 9 percent is Lowell soils, and 18 percent is minor soils.

Maury and Lowell soils are on broad, gently sloping to sloping ridges. McAfee soils are on narrow ridgetops and upper hillsides. All of these soils have a silt loam surface layer and a dominantly clayey subsoil. Permeability is moderately show in McAfee and Lowell soils and moderate or moderately rapid in Maury soils. Maury and Lowell soils are deep to bedrock, and McAfee soils are moderately deep.

The minor soils are Faywood, Lowell Variant, and Fairmount soils on uplands, Nolin, Lindside, and Dunning soils on the flood plains, and Elk soils on stream terraces.

The soils making up this map unit are mainly used for cultivated crops, hay, and pasture. Cultivated crops are grown mostly on Maury and Lowell soils. These upland soils are the most productive in the county. The soils remain in trees in only a few areas. Many large horse farms and the city of Paris are in the areas of this map unit.

The soils are well suited to cultivated farm crops, but

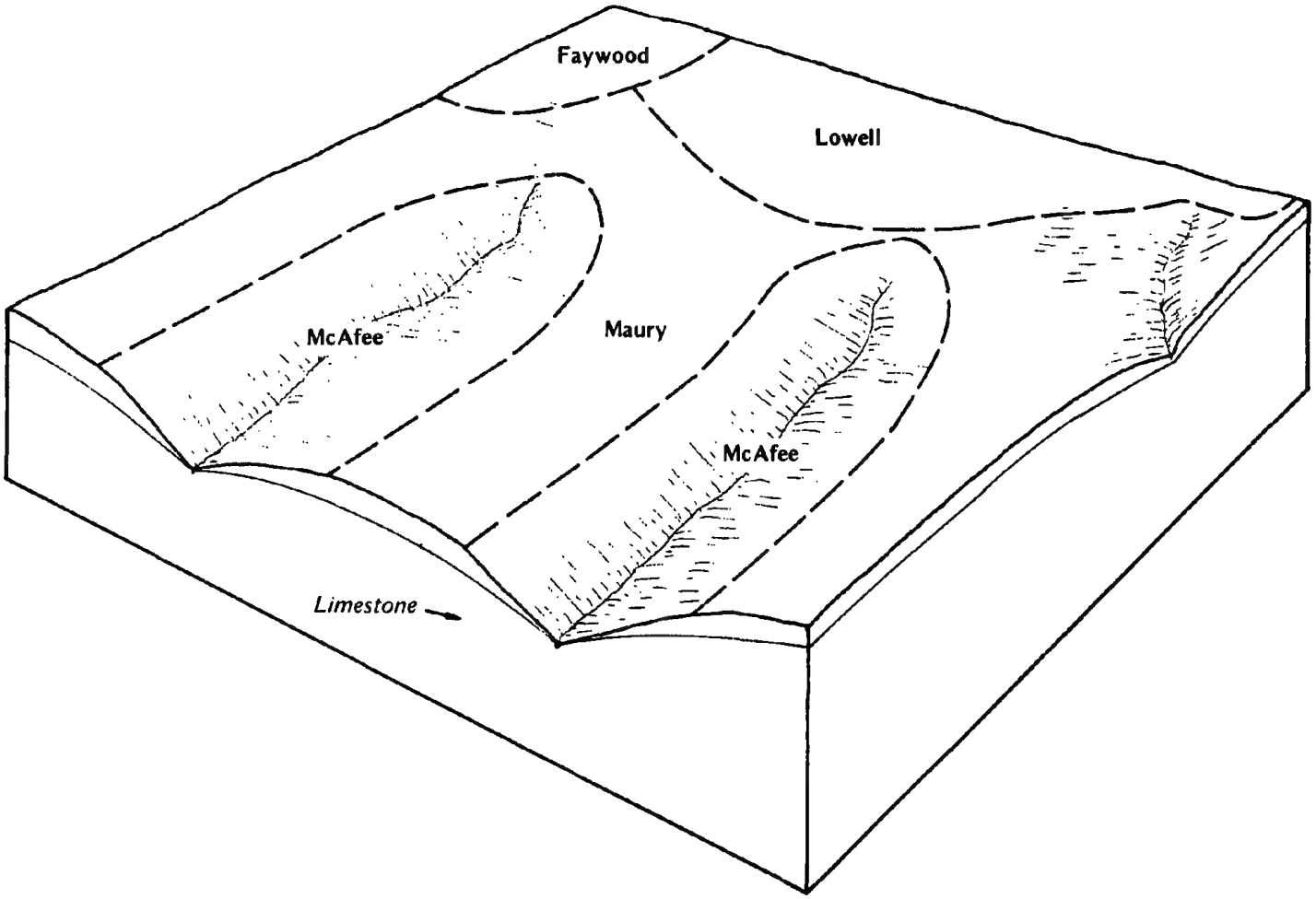


Figure 2.—Typical pattern of soils and parent material in the Maury-McAfee-Lowell map unit.

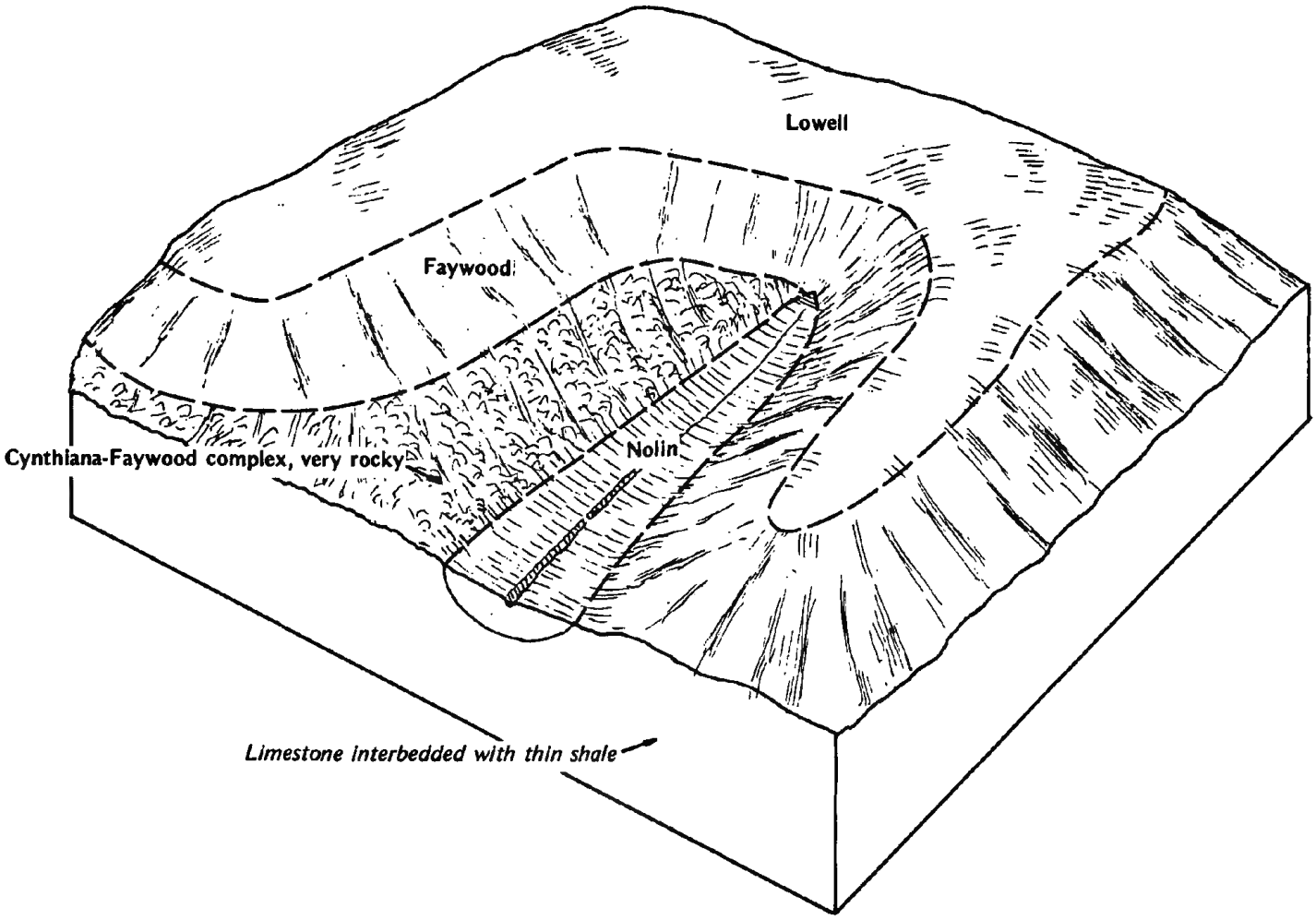


Figure 3.—Typical pattern of soils and parent material in the Lowell-Faywood-Cynthiana map unit.

measures to control erosion are necessary. The risk of erosion, steepness of slopes, and limited depth for root growth in McAfee soils limit their use for cultivated crops. The soils are well suited to pasture and hay crops.

The soils are suited to most specialty crops. The clayey subsoil restricts the growth of root crops.

The soils are well suited to use as woodland. Control of competing plants is the main concern in management.

The soils are well suited to most urban uses and to intensive recreation uses. The main limitations are moderate depth to rock in McAfee soils, moderately slow permeability of the subsoil in Lowell and McAfee soils, the moderate shrink-swell potential of Lowell and McAfee soils, and steepness of slopes.

3. Lowell-Faywood-Cynthiana

Gently sloping to steep, deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping soils on long, moderately broad ridges and sloping to steep soils on hillsides that are dissected by many small streams and drainageways. The steeper soils are near major streams and drainageways and are dominantly moderately deep or shallow; they are rocky in some areas. The major soils formed in material that weathered from limestone and interbedded shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 33 percent of Bourbon County. About 38 percent of the map unit is Lowell soils, 37 percent is Faywood soils, 5 percent is Cynthiana soils, and the remaining 20 percent is minor soils (fig. 3).

Lowell soils are on the broader ridges and upper side slopes. Faywood soils are on narrow ridges and upper side slopes. Cynthiana soils are on hillsides below Lowell and Faywood soils.

Lowell soils have a silt loam surface layer, and Faywood soils have a silt loam or silty clay loam surface layer. Lowell and Faywood soils have a clayey subsoil.

Lowell soils are deep and Faywood soils are moderately deep to bedrock. Permeability is moderately slow or slow in Faywood soils and moderately slow in Lowell soils. Cynthiana soils are flaggy and clayey throughout the profile. They are shallow to bedrock and have moderately slow permeability. Flagstones and outcrops of rock are common in Cynthiana soils.

The minor soils are Maury and Fairmount soils on uplands, Elk soils on stream terraces, and Nolin, Lindside, Newark, and Dunning soils on flood plains.

The soils making up this map unit are used for pasture, hay, and cultivated crops. Pasture is by far the main use. In a few areas the soils remain in woodland. Many large farms and the towns of Millersburg, Ruddles Mill, Spears Mill, and North Middletown are in areas of this map unit.

The soils are suited to cultivated crops; however, measures to control erosion are necessary. Steepness of slopes, risk of soil erosion, limited depth for root growth in the Faywood and Cynthiana soils, and a clayey subsoil are the main limitations for cultivated crops. The soils are suited to pasture and hay crops.

The soils are poorly suited to most specialty crops. The main limitations are steepness of slopes, limited depth for root growth in Faywood and Cynthiana soils, risk of soil erosion, and a clayey subsoil. The clayey subsoil limits the use of these soils for root crops. Lowell and Faywood soils, where they are gently sloping, are suited to some vegetable crops and to orchards and vineyards.

The soils in this map unit are suited to use as woodland. Limitations in the use of equipment, the hazard of erosion, and plant competition are the main concerns in management.

The soils are suited to most urban uses and intensive recreation uses. Steepness of slopes, depth to rock in Faywood and Cynthiana soils, moderately slow or slow permeability of the clayey subsoil, and the shrink-swell potential are the main limitations.

4. Faywood-McAfee-Cynthiana

Dominantly sloping to steep, moderately deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on narrow ridges and hillsides

This map unit consists of sloping to steep soils on narrow ridges and hillsides that are dissected by many small streams and drainageways. In a few areas the soils on ridges are gently sloping. The steeper areas are near major streams and are more shallow and rocky. The major soils formed in material that weathered from limestone and thin interbedded shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 2 percent of Bourbon County. About 49 percent of the unit is Faywood soils, 16 percent is McAfee soils, 10 percent is Cynthiana soils, and the remaining 25 percent is minor soils.

Faywood and McAfee soils are on narrow ridges and upper side slopes. Cynthiana soils are on hillsides. The surface layer of all three soils is mostly silty clay loam, and the subsoil is dominantly clayey. Flagstones and rock outcrops are common in Cynthiana soils. Faywood and McAfee soils are moderately deep to bedrock, and Cynthiana soils are shallow. Permeability of Cynthiana and McAfee soils is moderately slow, and that of Faywood soils is moderately slow or slow.

The minor soils are Lowell and Maury soils on ridges, Eden and Fairmount soils on hillsides, Elk soils on stream terraces, and Nolin soils on flood plains.

The soils making up this map unit are used mainly for pasture and hay, to which they are suited. The soils are poorly suited to cultivated crops, most specialty crops, urban uses, and intensive recreation uses. Depth to rock and steepness of slopes are the main limitations of these soils for these uses. The risk of soil erosion, droughtiness, and coarse fragments also limit the use of the soils for cultivated crops and most specialty crops. The shrink-swell potential and moderately slow or slow permeability of the clayey subsoil additionally limit the use of the soils for urban and recreation development.

The soils are suited to use as woodland. Restricted use of equipment, the hazard of erosion, plant competition, and seedling mortality are the main concerns in management.

5. Faywood-Eden-Cynthiana

Sloping to steep, moderately deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil and in places a clayey and flaggy subsoil; on narrow ridges and hillsides

This map unit consists of dominantly sloping to moderately steep soils on narrow ridges and moderately steep and steep soils on hillsides that are dissected by many small streams and drainageways. The moderately steep and steep soils are more shallow, rocky and eroded. The major soils formed in material that weathered from limestone and interbedded siltstone and calcareous shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 8 percent of Bourbon County. About 50 percent of the map unit is Faywood soils, 23 percent is Eden soils, 5 percent is Cynthiana soils, and the remaining 22 percent is minor soils.

Faywood soils are on ridges and to a lesser extent on upper side slopes. Eden and Cynthiana soils are on hillsides. Faywood soils have a silt loam surface layer and a dominantly clayey subsoil. Eden soils have a silty clay loam or flaggy silty clay surface layer and a clayey subsoil. Cynthiana soils have a silty clay loam surface layer and a flaggy clayey subsoil. Flagstones and

outcrops of rock are common in Cynthiana soils. Faywood and Eden soils are moderately deep to bedrock, and Cynthiana soils are shallow to bedrock. Faywood and Cynthiana soils have moderately slow or slow permeability, and Eden soils have slow permeability.

The minor soils are Lowell, McAfee, and Fairmount soils on uplands, Elk soils on stream terraces, and Nolin and Lindside soils on flood plains.

The soils making up this map unit are mainly used for pasture. Most of the minor soils on terraces and bottoms are used for continuous cultivated crops.

The soils are poorly suited to cultivated farm crops and specialty crops. Steepness of slopes, limited depth for root growth, the risk of erosion, droughtiness, and the clayey subsoil are the main limitations. The soils are suited to pasture and hay crops.

The soils are suited to use as woodland. Restricted use of equipment, seedling mortality, the hazard of erosion, and plant competition are the main limitations.

The soils are poorly suited to urban uses and to intensive recreation uses. Steepness of slopes, slow or moderately slow permeability, the shrink-swell potential, the clayey subsoil, and depth to bedrock are the main limitations.

6. Nolin-Elk-Lindside

Nearly level to sloping, deep, well drained to moderately well drained soils that have a loamy subsoil; on stream terraces and flood plains

This map unit consists of nearly level to sloping soils in narrow to broad areas on stream terraces and flood plains along the major streams. The soils formed in alluvium that derived from limestone, shale, and siltstone.

This map unit makes up about 8 percent of Bourbon County. About 40 percent of the map unit is Nolin soils, 23 percent is Elk soils, 12 percent is Lindside soils, and 25 percent is minor soils.

Nolin and Lindside soils are on narrow to moderately broad flood plains. Elk soils are on narrow to broad stream terraces. Nolin soils are deep, well drained, loamy soils. Lindside soils are deep, moderately well drained, loamy soils. Nolin and Lindside soils are subject to flooding during winter and early in spring. They are rarely flooded in summer and fall. Nolin and Lindside soils have moderate permeability. Elk soils are deep, well drained, loamy, and moderately permeable. They are on higher elevations than Nolin and Lindside soils, but in some areas they are subject to rare flooding.

The minor soils are Dunning and Newark soils on flood plains and Lawrence and Otwell soils on stream terraces.

The soils making up this map unit are used mainly for cultivated farm crops, hay, and pasture. The soils are well suited to these uses. The main limitations are small wet or seepage areas, small oddly shaped areas that are not economical for equipment operation, the hazard of erosion on Elk soils, and flooding in winter and early in spring.

The soils are suited to specialty crops. They are especially well suited to warm-season vegetables. The main limitations are the moderate wetness of Lindside soils, the hazard of flooding, poor air drainage, and the threat of frost late in spring and early in fall.

The soils are well suited to use as woodland, but in most places the soils are farmed. Competition of undesirable plants is the main concern in management of tree seedlings.

The soils are poorly suited to urban uses and to intensive recreation uses. The main limitations are a seasonal high water table and the risk of flooding.

description of the soils in Nicholas County

1. Faywood-Lowell-Cynthiana

Gently sloping to steep, well drained to somewhat excessively drained, deep to shallow soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping and sloping soils on long and narrow to moderately broad ridges and sloping to steep soils on hillsides that are dissected by many small drainageways. The steep soils are near major streams and are more shallow and rocky. The major soils formed in material that weathered from limestone and thin interbedded shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 7 percent of Nicholas County. About 40 percent of the map unit is Faywood soils, 24 percent is Lowell soils, 12 percent is Cynthiana soils, and 24 percent is minor soils.

Faywood soils are on narrow ridges and side slopes. Lowell soils are on broad ridges and upper side slopes. Cynthiana soils are on hillsides below Lowell and Faywood soils. Faywood soils have a silt loam or silty clay loam surface layer, and Lowell soils have a silt loam surface layer; the subsoil of Lowell and Faywood soils is clayey. Permeability is moderately slow in Lowell soils and moderately slow or slow in Faywood soils. Lowell soils are deep to bedrock; Faywood soils are moderately deep. Cynthiana soils are clayey, moderately slowly permeable, and shallow to bedrock; flagstones are common, and bedrock is exposed in some places.

The minor soils are Fairmount, Lowell Variant, and McAfee soils on uplands, Elk soils on stream terraces, and Nolin soils on flood plains.

The soils making up this map unit are used primarily for pasture, hay, and cultivated crops. In a few areas the soils remain in trees.

The soils are suited to cultivated crops; however, measures to control erosion are necessary. Steepness

of slopes, risk of soil erosion, and limited depth for root growth in Faywood and Cynthiana soils are the main limitations to the use of these soils for cultivated crops. The soils are suited to hay and pasture.

The soils in this map unit are suited to specialty crops. They are better suited to orchards and vineyards than to most vegetable crops. Steepness of slopes, risk of soil erosion, high clay content of the subsoil, and depth to bedrock in Faywood and Cynthiana soils are the main limitations.

The soils are suited to use as woodland. The hazard of erosion, equipment limitations, plant competition, and seedling mortality are the main limitations.

The soils are suited to some urban uses and to some intensive recreation uses. Moderately slow or slow permeability of the subsoil, depth to bedrock, and steepness of slopes are the main limitations.

2. Lowell-Faywood-Maury

Gently sloping to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping soils on long, moderately broad to broad ridges and sloping to moderately steep soils on hillsides that are dissected by many small streams and drainageways. In a few areas there are small sinkholes and depressions. The major soils formed in material that weathered from limestone and shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up 3 percent of Nicholas County. About 34 percent of this map unit is Lowell soils, 27 percent is Faywood soils, 26 percent is Maury soils, and 13 percent is minor soils.

Lowell and Maury soils are on broad ridges and upper side slopes. Faywood soils are on narrow ridges and steeper side slopes. All of these soils have a silt loam surface layer and a dominantly clayey subsoil. Faywood soils have moderately slow or slow permeability, and Lowell soils have moderately slow permeability. Maury soils have moderate or moderately rapid permeability. Lowell and Maury soils are deep to bedrock, and Faywood soils are moderately deep.

The minor soils are McAfee and Cynthiana soils on uplands, Elk soils on stream terraces, and Nolin soils on flood plains.

The soils making up this map unit are used mostly for cultivated crops, hay, and pasture. The soils remain in woodland in only a few small areas.

The soils are well suited to cultivated crops, hay, and pasture. The risk of soil erosion, limited depth for root growth in Faywood soils, and steepness of slopes are the main limitations.

The soils are suited to specialty crops. High clay content of the subsoil, depth to bedrock in Faywood soils, and steepness of slopes are the main limitations.

The soils are suited to trees, but in most areas the soils are farmed. The hazard of erosion and plant competition are concerns in management.

The soils are suited to most urban uses and intensive recreation uses. Moderately slow permeability of Lowell soils and moderately slow or slow permeability of Faywood soils, the moderate shrink-swell potential of Lowell and Faywood soils, depth to bedrock in Faywood soils, and steepness of slopes are the main limitations.

3. Faywood-Cynthiana

Gently sloping to steep, well drained to somewhat excessively drained; moderately deep and shallow soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping and sloping soils on long, narrow ridges and moderately steep and steep soils on hillsides that are dissected by many small streams and drainageways. The steeper soils are more shallow, more rocky, and more eroded. The major soils formed in material that weathered from limestone and shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 8 percent of Nicholas County. About 65 percent of this map unit is Faywood soils, 12 percent is Cynthiana soils, and 23 percent is minor soils.

Faywood soils are on the broader ridges and side slopes. They have a silt loam or silty clay loam surface layer and a clayey subsoil. Faywood soils have moderately slow to slow permeability. They are moderately deep to bedrock. Cynthiana soils are on hillsides below Faywood soils. They have a silty clay loam or silty clay surface layer and a flaggy silty clay or clay subsoil. Cynthiana soils have moderately slow permeability and are somewhat excessively drained. They are shallow to bedrock, and flagstones and rock outcrops are common on the surface.

The minor soils are Lowell and McAfee soils on uplands, Elk soils on stream terraces, and Nolin soils on flood plains.

The soils making up this map unit are used mainly for pasture, but in some small areas they are used for cultivated crops and hay. Most of the cultivated crops are grown on minor soils on narrow flood plains and stream terraces. The soils are suited to pasture and hay crops.

The soils are poorly suited to cultivated farm crops, most specialty crops, urban uses, and intensive recreation uses. They are suited to orchards and vineyards. Steepness of slopes, depth to bedrock, moderately slow and slow permeability, the high clay content of the subsoil, and the moderate shrink-swell potential are the main limitations. The high content of coarse fragments in Cynthiana soils and the risk of soil erosion are limitations for some uses.

The soils are suited to use as woodland. The hazard of erosion, limitations on the use of equipment, and

seedling mortality are the main concerns in management.

4. Eden-Faywood-Cynthiana

Sloping to steep, moderately deep and shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on long, narrow ridges and hillsides

This map unit consists of dominantly sloping to steep soils on long, narrow ridges and hillsides that are dissected by many small streams and drainageways. The moderately steep and steep soils are more shallow, flaggy, and eroded. The major soils formed in material that weathered from calcareous shale and interbedded thin layers of limestone and siltstone. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 7 percent of Nicholas County. About 40 percent of this map unit is Eden soils, 35 percent is Faywood soils, 10 percent is Cynthiana soils, and the remaining 15 percent is minor soils.

Eden soils are on narrow ridges and hillsides. Faywood soils are on broader ridges and upper side slopes. Cynthiana soils are on hillsides. Faywood soils have a silt loam or silty clay loam surface layer and a clayey subsoil. Eden and Cynthiana soils generally have a silty clay surface layer and a flaggy clayey subsoil. Permeability is moderately slow or slow in Faywood soils, moderately slow in Cynthiana soils, and slow in Eden soils. Eden and Faywood soils are moderately deep to bedrock, and Cynthiana soils are shallow. Flagstones and outcrops of rock are common in the Cynthiana soils.

The minor soils are Lowell Variant, McAfee, Nicholson, and Fairmount soils on uplands, Elk soils on stream terraces, and Nolin soils on flood plains.

The soils making up this map unit are used mainly for pasture, but in some areas cultivated crops and hay are grown on broader ridges, narrow terraces, and bottoms. Many small plots are in black locust trees, which are used for fence posts. The soils are suited to pasture and hay crops, but droughtiness limits yields, and the use of equipment is difficult on the steeper slopes.

The soils are poorly suited to cultivated crops, most specialty crops, urban uses, and intensive recreation uses. They are, however, suited to orchards and vineyards. Steepness of slopes, very severe erosion hazard, depth to bedrock, moderately slow or slow permeability, and the high clay content and the moderate shrink-swell potential of the subsoil are the main limitations.

The soils are suited to use as woodland. Limitations on the use of equipment, risk of soil erosion, plant competition, and seedling mortality are the main concerns in management.

5. Faywood-Eden-Lowell

Sloping to steep, moderately deep and deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

This map unit consists of gently sloping and sloping soils on long and narrow to moderately broad ridges and moderately steep and steep soils on hillsides that are dissected by many streams and drainageways. The moderately steep and steep soils are more shallow, flaggy, and eroded. The major soils formed in material that weathered from limestone, siltstone, and calcareous shale. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 9 percent of Nicholas County. Faywood soils make up about 32 percent of the map unit, Eden soils 29 percent, Lowell soils 24 percent, and the remaining 15 percent is minor soils.

Faywood soils are on narrow ridges and upper side slopes (fig. 4). Eden soils are on hillsides. Lowell soils are on broad ridges and upper side slopes. Faywood and Lowell soils have a silt loam surface layer and a clayey subsoil. Permeability is moderately slow in Lowell soils and moderately slow or slow in Faywood soils. Lowell soils are deep and Faywood and Eden soils are moderately deep to bedrock. Eden soils have a silty clay loam or silty clay surface layer and a flaggy clayey subsoil, and their permeability is slow.

The minor soils are Cynthiana and Nicholson soils on uplands, Elk soils on stream terraces, and Nolin and Lindside soils on flood plains.

The soils making up this map unit are used mainly for pasture, hay, and cultivated crops. In a few areas the soils remain in woods.

The soils are suited to cultivated crops, hay, and pasture. Steepness of slopes, risk of soil erosion, and limited depth for root growth in Faywood and Eden soils are the main limitations.

Except for the Eden soils, the soils in this map unit are suited to specialty crops. Faywood and Lowell soils on the broadest ridges are suited to fruit and some vegetable crops. They are less suited to root crops. Eden soils are poorly suited to specialty crops. The main limitations are steepness of slopes, the clayey subsoil, risk of soil erosion, and limited depth for root growth in Faywood and Eden soils.

The soils are suited to use as woodland. The risk of soil erosion, seedling mortality, plant competition, and restricted use of equipment because of the steepness of slopes are the main concerns in management.

The soils are suited to most urban and intensive recreation uses. Slow or moderately slow permeability of the clayey subsoil, depth to bedrock, steepness of slopes, and the shrink-swell potential are the main limitations. Lowell and Faywood soils, where they are gently sloping, are best suited to urban and intensive recreation uses.

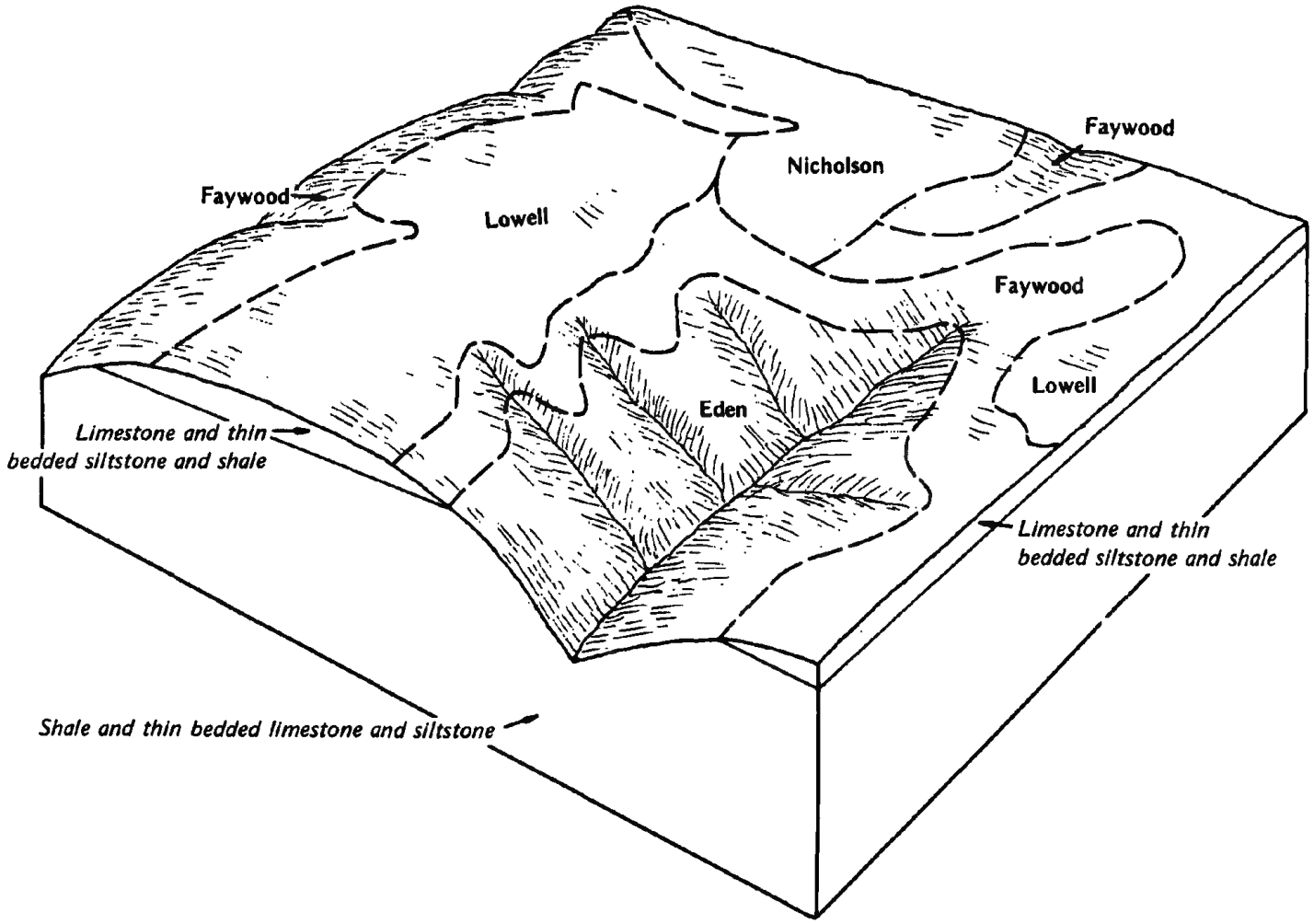


Figure 4.—Typical pattern of soils and parent material in the Faywood-Eden-Lowell map unit.

6. Eden

Sloping to steep, moderately deep, well drained soils that have a dominantly clayey and flaggy subsoil; on narrow ridges and hillsides

This map unit consists of sloping to steep soils in a highly dissected area that has long, narrow, winding ridges, steep hillsides and V-shaped valleys. The soils on hillsides are flaggy and are severely eroded. The major soils formed mainly in residual material that weathered from calcareous shale and thin layers of limestone and siltstone. Soils that formed in alluvium are in long, narrow areas along the major streams.

This map unit makes up about 63 percent of Nicholas County. About 75 percent of the map unit is Eden soils, and 25 percent is minor soils.

Eden soils are on narrow ridges and hillsides. They have a flaggy silty clay or silty clay loam surface layer and a flaggy clayey subsoil. They are slowly permeable. Depth to bedrock is moderate.

The minor soils are Faywood, Lowell, Lowell Variant, Nicholson, and Cynthiana soils on uplands, Allegheny, Elk, and Otwell soils on stream terraces, and Boonesboro, Lindside, and Nolin soils on flood plains.

The soils making up this map unit are used mainly for pasture, hay, and cultivated crops. There are stands of black locust, redcedar, maple, hickory, and oak trees scattered throughout.

The soils are poorly suited to cultivated crops. Steepness of slopes, risk of severe erosion, moderate depth to bedrock, high content of coarse fragments, and droughtiness are the main limitations for cultivated crops. The soils are suited to pasture and hay crops, but droughtiness limits yields of forage, and the use of machinery is limited by the steepness of slopes.

The soils are poorly suited to most specialty crops except orchards and vineyards. Steepness of slopes, risk of soil erosion, droughtiness, and a dominantly flaggy clayey surface layer are the main limitations.

The soils are suited to use as woodland. The severe hazard of erosion, seedling mortality, plant competition, and restricted use of equipment because of steep slopes and a clayey surface layer are the main limitations.

Eden soils are poorly suited to most urban uses and to intensive recreation uses. Steepness of slopes, slow permeability of the clayey subsoil, high content of flagstones, depth to bedrock, the shrink-swell potential, and the high content of clay are the main limitations.

7. Nolin-Allegheny-Elk

Nearly level to moderately steep, deep, well drained soils that have a loamy subsoil; on stream terraces and flood plains

This map unit consists of nearly level to moderately steep soils on narrow to moderately broad stream terraces and flood plains along Licking River and its major tributary streams. The soils formed in mixed alluvium from soils that derived from limestone, sandstone, siltstone, and shale.

This map unit makes up 3 percent of Nicholas County. About 39 percent of the unit is Nolin soils, 34 percent is Allegheny soils, 10 percent is Elk soils, and 17 percent is minor soils.

Nolin soils are nearly level on narrow flood plains, and they are subject to frequent flooding. Elk soils are nearly level to sloping, and Allegheny soils are gently sloping to moderately steep. Elk and Allegheny soils are on stream terraces above Nolin soils. Low-lying areas of Elk soils are subject to rare flooding. All of these soils have a loamy surface layer and a loamy subsoil and are deep to bedrock. Permeability is moderate.

The minor soils are Otwell soils on stream terraces and Boonesboro, Newark, and Lindside soils on flood plains.

The soils making up this map unit are used mainly for cultivated crops and hay. In a few areas the soils remain in woodland. The soils are well suited to cultivated crops, hay, and pasture. Flooding on Nolin soils and Elk soils in low-lying areas and the hazard of erosion on Allegheny and Elk soils in the steeper areas are the main limitations.

The soils are well suited to specialty crops. They drain well and warm up early in the spring. The loamy texture of the soils makes them especially well suited to root and nursery crops. Poor air drainage and the possibility of frost early in spring and early in fall are limitations for some crops. Control of erosion and flooding are the main concerns in management.

The soils are well suited to use as woodland. Control of weeds is the main concern in management of tree seedlings.

The soils are poorly suited to most urban uses and intensive recreation uses, mainly because of flooding on Nolin soils and on Elk soils in low-lying areas. Elk soils that are not subject to flooding and Allegheny soils are well suited to these uses, except where steepness of slopes is a limitation.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Lowell silt loam, 2 to 6 percent slopes, is one of several phases in the Lowell series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits-Dumps complex is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and suitability for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AlB—Allegheny loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil. It is on low stream terraces and on old stream terraces on high ridges along the Licking River in Nicholas County. The areas range from 3 to 40 acres in size.

Typically, the surface layer is dark yellowish brown loam about 11 inches thick. The upper part of the subsoil is brown and strong brown loam, and the lower part is strong brown and yellowish brown clay loam to a depth of 69 inches. Below that, the substratum to a depth of about 79 inches is strong brown loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. This soil is strongly acid to extremely acid, unless it is limed. Surface runoff is medium. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are small areas of Nolin soils on flood plains, Otwell and Elk soils on low stream terraces, and Lowell and Faywood soils on ridges. Also included are small areas of soils that are subject to flooding, small areas of soils that are more sandy than typical Allegheny soils, and small areas of soils that are less than 60 inches deep to bedrock. On the high ridges, a few areas of soils have a clayey subsoil at a depth of 50 to 60 inches. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

Most of this map unit is used for cultivated crops, small grains, hay, and pasture. The Allegheny soil is well suited to the cultivated crops commonly grown in the area. Erosion is a moderate hazard if cultivated crops

are grown. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. Drainageways need to be kept in permanent protective vegetative cover to reduce the erosive action of running water.

This soil is well suited to the hay and pasture plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is well suited to use as woodland. Suitable trees include eastern white pine, yellow-poplar, and black walnut. Plant competition is the main concern in management.

This soil is well suited to most urban uses. Some of the included soils on low stream terraces are severely limited because of flooding.

This map unit is in capability subclass IIe and in woodland group 2o.

AlC—Allegheny loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil. It is on low stream terraces and on old stream terraces on high ridges along the Licking River in Nicholas County. The areas range from 2 to 40 acres in size.

Typically, the surface layer is dark yellowish brown loam about 11 inches thick. The upper part of the subsoil is brown and strong brown loam, and the lower part is strong brown and yellowish brown clay loam to a depth of about 69 inches. Below that, the substratum to a depth of 79 inches is strong brown loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. This soil is strongly acid to extremely acid, unless it is limed. Surface runoff is medium to rapid. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are small areas of Nolin soils on flood plains, Elk and Otwell soils on low stream terraces, and Lowell, Faywood, Cynthiana, and Eden soils on ridges. Also included are small areas of soils that are more sandy than typical Allegheny soils and small areas of soils that are less than 60 inches deep to bedrock. On high ridges, a few areas of soils have a clayey subsoil at a depth of 50 to 60 inches. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

Most of this map unit is used for cultivated crops, small grains, hay, and pasture. The Allegheny soil is suited to the cultivated crops commonly grown in the area. Erosion is a severe hazard if cultivated crops are grown. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. Drainageways need to be kept in permanent protective vegetative cover to reduce the erosive action of running water.

This soil is well suited to the grasses and legumes commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and controlled grazing.

This soil is well suited to use as woodland. Suitable trees include eastern white pine, yellow-poplar, and black walnut. Plant competition is the main concern in management.

This soil is suited to most urban uses. Some of the included soils on low stream terraces are severely limited because of flooding. Steepness of slopes is a limitation for some uses.

This map unit is in capability subclass IIIe and in woodland group 2o.

AlD—Allegheny loam, 12 to 20 percent slopes. This is a deep, well drained, moderately steep soil. It is on low stream terraces and on old stream terraces on high ridges along the Licking River in Nicholas County. The areas range from 2 to 20 acres in size.

Typically, the surface layer is dark yellowish brown loam about 11 inches thick. The upper part of the subsoil is brown and strong brown loam, and the lower part is strong brown and yellowish brown clay loam to a depth of about 69 inches. The substratum to a depth of about 79 inches is strong brown loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. This soil is strongly acid to extremely acid, unless it is limed. Surface runoff is medium to rapid. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are small areas of Elk soils on low stream terraces, Nolin soils on flood plains, and Cynthiana, Faywood, Eden, and Lowell soils on ridges. Also included are small areas of soils that are more sandy than typical Allegheny soils, soils that are less than 60 inches deep to bedrock, and soils that have a clayey subsoil at a depth of 50 to 60 inches. The included soils make up 10 to 15 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is used mainly for hay and pasture. In a few areas it is used as woodland.

This soil is poorly suited to cultivated crops because erosion is a very severe hazard. Nevertheless, all of the row crops commonly grown in the area can be grown occasionally. Some practices that help to slow surface runoff and control erosion are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Drainageways need to be kept in permanent protective vegetative cover to reduce the erosive action of running water.

This soil is suited to most of the grasses and legumes commonly grown in the area. The main management needs are proper stocking rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing. A short and sparse cover of plants increases the possibility of erosion.

This soil is well suited to use as woodland. Suitable trees include eastern white pine, yellow-poplar, and black walnut. Limitations on the use of equipment, the hazard of erosion, and plant competition are the main concerns in management.

This soil is poorly suited to most urban uses mainly because of steepness of slopes.

This map unit is in capability subclass IVe and in woodland group 2r.

Bo—Boonesboro silt loam. This is a moderately deep, well drained, nearly level to gently sloping soil. It is on the long, narrow flood plains of the smaller streams in Nicholas County. It formed in alluvium that derived primarily from limestone. The areas range from 2 to 50 acres in size. Slope ranges from 0 to 4 percent.

Typically, the surface layer is brown silt loam about 12 inches thick. The upper part of the subsoil is dark yellowish brown gravelly silty clay loam, and the lower part is dark yellowish brown gravelly loam to a depth of about 32 inches. Limestone bedrock is at a depth of about 32 inches.

This soil has high natural fertility. The content of organic matter is moderate. This soil is slightly acid to mildly alkaline. Permeability is moderately rapid, and the available water capacity is moderate. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep. Surface runoff is slow. Bedrock is at a depth of 20 to 40 inches. This soil is subject to frequent flooding.

Included with this soil in mapping are small areas of Nolin, Lindside, and Elk soils, and some areas of soils that are gravelly and channery and are therefore difficult to cultivate. The included soils make up 15 to 20 percent of the map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for hay and pasture crops. In a few areas it is used as woodland, and in other areas it is used for corn and tobacco. It is suited to cultivated crops. Where this soil is used for cultivated crops, the stream channel has been widened, and dikes and levees have been constructed to reduce overflow at the beginning of the growing season. A few areas are flooded during the growing season. Runoff and overwash from adjacent higher soils can be reduced by constructing ditches to intercept the water. Some practices that help to maintain good tilth and to insure continued high crop yields are stubble mulching, returning crop residue to the soil, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs.

This soil is suited to pasture and hay crops. It is best suited to grasses and legumes that can withstand flooding of short duration. The main management needs are proper seeding rates and mixtures, control of weeds, and control of grazing. Grazing before the plants are well established, overgrazing, and grazing when the soil is saturated damage the plants and result in thin cover, which increases the possibility of weed competition and the need for early renovation.

This soil is well suited to use as woodland. Suitable trees include black walnut, eastern cottonwood, sweetgum, yellow-poplar, white ash, eastern white pine, and shortleaf pine. Plant competition is severe, and cultivation, or weeding by other methods, is required to control undesirable plants until tree seedlings are established.

This soil is poorly suited to most urban uses because flooding is a hazard. Depth to rock is a limitation for some uses.

This map unit is in capability subclass IIs and in woodland group 1o.

CnD—Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes. This map unit consists of sloping to moderately steep Cynthiana and Faywood soils on ridges and hillsides (fig. 5). Cynthiana soils are shallow and well drained or somewhat excessively drained. Faywood soils are moderately deep and well drained. Cynthiana and Faywood soils are so intermingled that they could not be separated at the scale selected for mapping. Faywood soils are commonly on ridges above Cynthiana soils. Limestone fragments, mostly about 1 to 2 inches thick and 6 to 15 inches long, cover about 5 percent of the surface. Exposed limestone bedrock makes up about 5 percent of the surface area; it is found about every 170 feet. The areas range from 5 to 70 acres in size.

About 50 percent of this map unit is Cynthiana soils. Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. Below that, the subsoil, to a depth of about 16 inches, is yellowish brown silty clay. Limestone bedrock is at a depth of about 16 inches.

Cynthiana soils have moderately slow permeability. The available water capacity is very low. Natural fertility is medium, and the content of organic matter is low. The root zone is shallow. These soils are slightly acid to

Figure 5.—Pasture in an area of Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes. Faywood silt loam, 6 to 12 percent slopes, is the soil in the background.

mildly alkaline. Surface runoff is medium to rapid. Tilth is poor because of the high content of clay. The depth to bedrock ranges from 10 to 20 inches, but in most places bedrock is at a depth of about 16 inches. The shrink-swell potential is moderate in the clayey subsoil.

About 35 percent of this map unit is Faywood soils. Typically, the surface layer is brown silty clay loam about 7 inches thick. The subsoil, to a depth of about 24 inches, is yellowish brown silty clay or clay. The substratum to a depth of 29 inches is pale brown flaggy clay. Limestone bedrock is at a depth of about 29 inches.

Faywood soils have moderately slow or slow permeability. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep. These soils are neutral to strongly acid, unless they are limed. Surface runoff is medium to rapid. Tilth is fair because of the silty clay loam texture of the plow layer. Depth to bedrock ranges from 20 to 40 inches, but is generally about 29 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with these soils in mapping are small areas of Eden, Lowell, and Fairmount soils. These areas make up 10 percent of the map unit.

In most areas of this map unit, the soils are used for unimproved pasture. Many areas, however, have reverted to brush and woodland. The soils are poorly suited to cultivated crops because of steepness of slopes, shallowness to rock, the very severe hazard of erosion, and droughtiness. Common flagstones and rock outcrops make the use of machinery very difficult. Yields of most crops are very low.

The soils are suited to pasture and hay crops, but control of weeds and establishment of plants are difficult. In a few areas, loose rocks have been removed from the surface, and the soils are easier to manage. Densely rooted grasses such as Kentucky 31 fescue are best adapted because of their ability to hold the soil and withstand droughtiness. The main management needs are proper seeding rates and mixtures, control of weeds, and controlled grazing.

The potential for use of the soils as habitat for woodland wildlife is fair.

The soils are suited to use as woodland. The hazard of erosion, equipment limitations, seedling mortality, and

plant competition are concerns in management. Trees adapted to Cynthiana soils include eastern redcedar and Virginia pine, and those adapted to Faywood soils include shortleaf pine, loblolly pine, eastern white pine, eastern redcedar, and black locust.

The soils are poorly suited to urban development because of steepness of slopes, common flagstones and rock outcrops, and moderate to shallow depth to rock.

This map unit is in capability subclass VIs. The woodland group is 4d for Cynthiana soils and 3c for Faywood soils.

CnE—Cynthiana-Faywood complex, very rocky, 20 to 35 percent slopes. This map unit consists of steep Cynthiana and Faywood soils on hillsides dissected by many V-shaped hollows and on short hillsides bordering stream channels. Most areas are long and narrow, but some cover a wide expanse. The Cynthiana soils are shallow and well drained or somewhat excessively drained. Faywood soils are moderately deep and well drained. These soils are so intermingled that they could not be separated at the scale selected for mapping. About 5 percent of the surface area consists of limestone outcrops, and limestone fragments cover about 10 percent of the surface. The areas range from 5 to more than 100 acres in size.

About 50 percent of this map unit is Cynthiana soils. Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. The subsoil, to a depth of 16 inches, is yellowish brown silty clay. Limestone bedrock is at a depth of about 16 inches.

Cynthiana soils have moderately slow permeability. The available water capacity is very low. Natural fertility is medium, and organic matter content is low. The root zone is shallow. These soils are slightly acid to mildly alkaline. Surface runoff is rapid. Tilth is poor because of the high clay content. The depth to bedrock ranges from 10 to 20 inches, but is generally about 16 inches. The shrink-swell potential is moderate in the clayey subsoil.

About 30 percent of this map unit is Faywood soils. Typically, the surface layer is brown silty clay loam about 7 inches thick. The subsoil, to a depth of about 24 inches, is yellowish brown silty clay or clay. The substratum, to a depth of about 29 inches, is pale brown flaggy clay. Limestone bedrock is at a depth of about 29 inches.

Faywood soils have moderately slow to slow permeability. The available water capacity is moderate. Natural fertility is medium and the content of organic matter is moderate. The root zone is moderately deep. These soils are neutral to strongly acid, unless they are limed. Surface runoff is rapid. Tilth is fair because of the silty clay loam texture of the plow layer. Depth to bedrock ranges from 20 to 40 inches, but is generally about 29 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with these soils in mapping are small areas of Eden, Lowell, and Fairmount soils, small areas of soils that are not rocky, and a few areas of soils that are moderately eroded. These areas make up 15 percent of the map unit.

The soils in this map unit are mainly in unimproved pasture or brush or are used as woodland. They are poorly suited to cultivated crops because of steep slopes, shallowness to rock, common flagstones, and rock outcrops. The hazard of erosion is very severe.

These soils are poorly suited to pasture and hay crops because mowing and renovation of the pasture are difficult. The hazard of erosion is very severe. In seasons with adequate rainfall a fair amount of forage can be produced with good management. Densely rooted grasses such as Kentucky 31 fescue are best adapted to these soils because of their ability to hold the soil and withstand droughtiness. The main management needs are proper seeding rates and mixtures, establishing a good sod, control of weeds, and controlled grazing.

The potential for use of the soils as habitat for woodland wildlife is fair.

The soils are suited to use as woodland. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are concerns in management. Trees that commonly grow on this map unit are redcedar, black locust, scrub oak, black walnut, hickory, and maple. Trees adapted to Cynthiana soils include eastern redcedar and Virginia pine, and those adapted to Faywood soils are shortleaf pine, loblolly pine, eatern white pine, eastern redcedar, and black locust.

The soils are poorly suited to urban uses because of steep slopes, common flagstones and rock outcrops, and moderate to shallow depth to rock.

This map unit is in capability subclass VIIs. The woodland group is 4d for Cynthiana soils and 3c for Faywood soils.

Du—Dunning silty clay loam. This is a deep, very poorly to poorly drained, nearly level soil. It is in depressed areas on flood plains. The areas are long and narrow and range from 3 to 100 acres in size. They are along most of the smaller streams in Bourbon County. Slope ranges from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsurface layer, to a depth of about 20 inches, is black silty clay loam. The subsoil, to a depth of 48 inches, is dark gray silty clay with common yellowish brown and pale brown mottles. The substratum to a depth of 72 inches is dark gray clay.

Natural fertility is medium, and the content of organic matter is moderate. Permeability is slow, and the available water capacity is high. The root zone is deep. The soil is slightly acid to mildly alkaline throughout the profile. Runoff is slow. Tilth is fair because of wetness and high clay content of the plow layer. The water table is at or near the surface in winter and spring, when most areas are subject to frequent flooding. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Nolin, Lindside, Newark, and Lowell Variant soils and some areas of soils that are similar to Dunning soils, except that they have a lighter surface layer and are better drained. The soils in a few areas are not subject to flooding. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 2 acres in size.

This soil is mainly cleared and in pasture. In a few areas it is used for corn and hay crops. If this soil is artificially drained, it can be highly productive cropland.

This soil is suited to cultivated crops if it is drained. The limitations are flooding, a seasonal high water table, and the high clay content of the surface layer. It is suited to pasture. Grasses and legumes that can tolerate wetness and flooding are best adapted. When the water table is near the surface, controlled grazing prevents damage to pasture plants.

This soil is well suited to use as woodland. Equipment limitations, seedling mortality, and plant competition are the main concerns in management. Pin oak and loblolly pine are suitable.

This soil has good potential for development of habitat for wetland wildlife. Shallow water areas, pit-type ponds, and springs can be developed in most areas.

This soil is poorly suited to most urban uses because of flooding, seasonal high water table, the shrink-swell potential, and slow permeability.

This map unit is in capability subclass IIIw and in woodland group 1w.

EdD—Eden silty clay loam, 6 to 20 percent slopes. This is a moderately deep, well drained, sloping to moderately steep soil on long, narrow convex ridgetops and side slopes. The content of limestone flagstones, siltstone, and shale fragments in the surface layer ranges from 0 to 10 percent. The areas range from 5 to more than 100 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. It is about 3 percent coarse fragments by volume. The subsoil, to a depth of about 28 inches, is firm, sticky and plastic silty clay. In the upper part it is light olive brown and is 10 percent coarse fragments. In the lower part it is light yellowish brown and is 20 percent coarse fragments. The substratum to a depth of about 50 inches is pale olive clay and weathered interbedded shale, siltstone, and limestone.

Permeability is slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is low. The root zone is moderately deep. This soil is medium acid to moderately alkaline. Surface runoff is medium to rapid. Tilth is poor because of the high clay content. The surface layer cracks when it is dry. The depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Cynthiana, Faywood, Lowell, and Nicholson soils. The included soils make up 20 to 30 percent of this unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly in unimproved pasture or brush or is used as woodland. It is poorly suited to cultivated crops because of the moderately steep slopes, droughtiness, the very severe erosion hazard, and common flagstones. In a few areas this soil is cultivated, but yields are low. It is suited to occasional cultivation if special practices are used to control erosion. They are, for example, minimum tillage, stripcropping, returning crop residue to the soil, contour tillage, and including grasses and legumes in the cropping system.

This soil is suited to hay and pasture. The hay and pasture plants selected should resist drought and require little renovation. The moderately steep slopes and common flagstones somewhat restrict mowing and renovation. Because of the steepness of slopes and very severe hazard of erosion, management of vegetation for ground cover and soil protection is most important. Proper stocking rates, rotational grazing, and controlling undesirable vegetation are some of the chief management needs.

The potential for use of this soil as habitat for woodland wildlife is fair.

This soil is suited to use as woodland. The main concerns in management are the hazard of erosion, equipment limitation, seedling mortality, and plant competition. The common tree species are redcedar, black walnut, maple, hickory, scrub oak, and black locust. Suitable trees include eastern redcedar, Virginia pine, Scotch pine, and Austrian pine.

This soil is poorly suited to most urban uses. The shrink-swell potential of the clayey subsoil, depth to rock, slow permeability, and moderately steep slopes are the main limitations.

This map unit is in capability subclass IVe and in woodland group 3c.

EfD3—Eden flaggy silty clay, 6 to 20 percent slopes, severely eroded. This is a moderately deep, well drained, sloping to moderately steep, severely eroded soil. It is on narrow ridgetops and the upper part of hillsides above areas of the steeper Eden soils. The content of limestone flagstones and siltstone and shale fragments ranges from 10 to 25 percent in the surface layer. This soil has lost most of the original surface through erosion, and the plow layer is now mostly subsoil material. Shallow gullies and areas that are shallow to thin-bedded limestone are common. The areas range from 5 to more than 400 acres in size.

Typically, the surface layer is dark grayish brown flaggy silty clay about 5 inches thick. It is about 20 percent coarse fragments by volume. The subsoil, to a depth of about 28 inches, is firm, sticky flaggy silty clay and about 30 percent limestone, siltstone, and weathered shale fragments. In the upper part it is light olive brown, and in the lower part it is light yellowish

brown. The substratum to a depth of about 50 inches is pale olive clay and weathered interbedded shale, siltstone, and limestone.

Permeability is slow. The available water capacity is moderate, natural fertility is medium, and the content of organic matter is low. The root zone is moderately deep. This soil is medium acid to moderately alkaline. Tilth is poor because of the high clay content and common flagstones. Surface runoff is rapid. The surface layer cracks when it is dry. The shrink-swell potential is moderate. The depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Cynthiana, Faywood, Lowell, and Nicholson soils. The included soils make up 20 to 30 percent of this map unit, but the areas of the individual soils are generally less than 5 acres in size.

This soil is mainly in unimproved pasture or brush or is used as woodland. In a few areas it is used for cultivated crops, but yields are low (fig. 6). It is poorly suited to cultivated crops because of the moderately steep slopes, droughtiness, the clayey surface layer, the very severe hazard of erosion, and common flagstones.

This soil is suited to hay and pasture. The hay and pasture plants selected should resist drought and require little renovation. The moderately steep slopes and common flagstones somewhat restrict mowing and renovation. Because of the steepness of slopes and the hazard of erosion, management of vegetation for ground cover and soil protection is most important. Proper stocking rates, rotational grazing, and controlling undesirable vegetation are some of the chief management needs.

Figure 6.—Tobacco and pasture in areas of Eden flaggy silty clay, 6 to 20 percent slopes, severely eroded, and Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded.

The potential for use of the soil as habitat for woodland wildlife is fair.

This soil is suited to use as woodland. The main concerns in management are the hazard of erosion, equipment limitation, and seedling mortality. The common trees are redcedar, black walnut, maple, hickory, scrub oak, and black locust. Suitable trees include eastern redcedar, Virginia pine, Scotch pine, and Austrian pine.

This soil is poorly suited to most urban uses because of the clayey subsoil, depth to rock, the shrink-swell potential, slow permeability, high content of coarse fragments, and moderately steep slopes.

This map unit is in capability subclass VIe and in woodland group 4c.

EfE3—Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded. This is a moderately deep, well drained, severely eroded, steep soil. It is on hillsides dissected by V-shaped valleys. The content of limestone flagstones, siltstone, and shale fragments in the surface layer ranges from 10 to 25 percent. This soil has lost most of the original surface layer through erosion, and the surface layer is now mostly subsoil material. Shallow gullies and areas that are shallow to thin-bedded limestone are common. The areas range from 5 to several hundred acres in size.

Typically, the surface layer is dark grayish brown flaggy silty clay about 5 inches thick. It is about 20 percent coarse fragments by volume. The subsoil is firm, sticky and plastic flaggy silty clay. It is about 30 percent limestone, siltstone, and weathered shale fragments and extends to a depth of about 28 inches. In the upper part it is light olive brown, and in the lower part it is light yellowish brown. The substratum to a depth of about 50 inches is pale olive clay and weathered interbedded shale, siltstone, and limestone.

Permeability is slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is low. The root zone is moderately deep. This soil is medium acid to moderately alkaline. Tilth is poor because of the high clay content and common flagstones. The depth to bedrock ranges from 20 to 40 inches. Surface runoff is rapid. The surface layer cracks when it is dry. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Cynthiana, Faywood, Lowell, and Fairmount soils. Also included are small areas of soils that have slopes of more than 30 percent and a few areas of soils that are less than 20 inches deep to bedrock and have common gullies. The included soils make up about 30 percent of this map unit, but the areas of the individual soils are generally less than 5 acres in size.

This soil is mainly in brushy pasture or used as woodland. It is poorly suited to cultivated crops because of steep slopes, common flagstones, and a very severe hazard of erosion.

This soil is poorly suited to pasture and hay crops. Seedbed preparation and weed control are difficult because of the steep slopes and common flagstones, which limit the use of machinery. This soil is best suited to permanent protective vegetative cover. It has fair potential as habitat for woodland wildlife.

This soil is suited to use as woodland. The most suitable trees are eastern redcedar, Scotch pine, Virginia pine, and Austrian pine. The main concerns of management are the erosion hazard, equipment limitation, and seedling mortality.

This soil is poorly suited to urban uses because of the steep slopes, depth to rock, slow permeability, the shrink-swell potential, and high content of coarse fragments.

This map unit is in capability subclass VIIe and in woodland group 4c.

EkA—Elk silt loam, 0 to 2 percent slopes. This is a deep, well drained nearly level soil. It is on low stream terraces along most larger streams. The areas range from 3 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil, to a depth of about 13 inches, is brown silt loam and, to a depth of about 54 inches, is brown, strong brown, and yellowish brown silty clay loam. The substratum to a depth of about 93 inches is yellowish brown silty clay loam.

Permeability is moderate. The available water capacity is high. Natural fertility is high. The content of organic matter is moderate. The root zone is deep. This soil is medium acid to strongly acid, unless it is limed. Surface runoff is slow. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting. This soil is subject to rare flooding.

Included with this soil in mapping are a few small areas of soils that are similar to Elk soils but are moderately well drained, a few areas of soils that are not subject to flooding, and some areas of soils with short steep slopes. The included soils make up less than 10 percent of this map unit, but the areas of the individual soils generally are less than 1 acre in size.

This soil is mainly used for cultivated crops, small grains, hay, and pasture. This soil is well suited to all the locally grown cultivated crops. It produces high yields under good management. Practices that add organic matter to the soil, maintain good tilth and insure continued high crop yields include stubble mulching, returning crop residue to the soil, planting winter crops, using minimum tillage, and including grasses and legumes in the cropping system. Precautions should be taken to maintain adequate surface drainage to avoid ponding and consequent drowning out of crops.

This soil is well suited to the hay and pasture plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to trees, but it is entirely farmed. Suitable trees include black walnut, yellow-poplar, loblolly pine, and eastern white pine. Controlling plant

competition in establishing tree seedlings is the main concern in management. Cultivation or weeding by other methods helps control undesirable plants until seedlings are established.

This soil is poorly suited to most urban uses because it is subject to flooding. In a few included areas it is not subject to flooding and is well suited to most urban uses.

This map unit is in capability class I and woodland group 2o.

EkB—Elk silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces and, to a lesser extent, on old stream terraces at a higher elevation along the Licking River in Nicholas County. The areas are generally long, narrow, and parallel to the smaller streams, and they range from 5 to 35 acres in size. Larger areas, of 35 to 100 acres or more, are in oxbows of the larger streams.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil, to a depth of about 13 inches, is brown silt loam and, to a depth of 54 inches, is brown, strong brown, and yellowish brown silty clay loam. The substratum to a depth of about 93 inches is yellowish brown silty clay loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. This soil is medium acid to strongly acid, unless it is limed. Surface runoff is slow to medium. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are a few small areas of Allegheny, Nolin, Lindside, Otwell, Dunning, Newark, and Lowell soils on low stream terraces. In a few included areas the soils are subject to flooding. On higher stream terraces the included soils are Allegheny, Faywood, Eden, and Lowell soils. The included soils make up less than 10 percent of this map unit, but the areas of the individual soils generally are less than 2 acres in size.

This soil is mainly used for cultivated crops, small grains, hay, and pasture. It is well suited to all locally grown cultivated crops. Corn, tobacco, soybeans, and hay are the most commonly grown crops. The erosion hazard is moderate if this soil is cultivated. This soil produces high yields under good management. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. A permanent protective vegetative cover reduces erosion in drainageways. A few low-lying areas on low stream terraces may be flooded during high floods in winter and spring, but crops are seldom damaged.

This soil is well suited to all the hay and pasture plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland, but it is mainly farmed. Suitable trees include black walnut, yellow-poplar, eastern white pine, and loblolly pine. Controlling plant competition in establishing tree seedlings is the main concern in woodland management. Cultivation or weeding by other methods helps control undesirable plants until seedlings are established.

This soil is well suited to most urban uses. Low strength is a limitation for roads and streets.

This map unit is in capability subclass IIe and in woodland group 2o.

EkC—Elk silt loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil. It is in narrow bands along the smaller streams, along drainageways, and adjacent to steeper side slopes. It occurs to a lesser extent on old stream terraces at a higher elevation along the Licking River in Nicholas County. The areas are generally long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil, to a depth of 13 inches, is brown silt loam and, to a depth of about 54 inches, is brown, strong brown, and yellowish brown silty clay loam. The substratum to a depth of about 93 inches is yellowish brown silty clay loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. This soil is medium acid to strongly acid, unless it is limed. Surface runoff is medium to rapid. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are small areas of Allegheny, Nolin, Otwell, Lindside, Newark, and Lowell soils. Also included are small areas of Allegheny, Faywood, Eden, and Lowell soils on the higher stream terraces. The included soils make up less than 10 percent of this map unit, but the areas of the individual soils generally are less than 2 acres in size.

This soil is mainly used for pasture and hay crops, but in a few areas it is used for cultivted crops. This soil is suited to cultivated crops, and all row crops commonly grown in the area are suitable. Steepness of slopes and a severe erosion hazard are the main limitations. Some practices that help to slow surface runoff, reduce erosion, and insure continued high crop yields are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. In many areas this soil is adjacent to steep hillsides, and runoff can cause an erosion problem unless control measures, such as diversion ditches, are provided. A permanent protective vegetative cover reduces erosion in drainageways.

This soil is well suited to all the grasses and legumes commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing. Overgrazing should be avoided because a short and sparse vegetative cover increases the possibility of soil erosion and weed competition.

This soil is well suited to trees. Suitable trees include black walnut, yellow-poplar, eastern white pine, and loblolly pine. Controlling plant competition by cultivation or other methods is often required until tree seedlings are established.

This soil is suited to most urban uses. Steepness of slopes is the main limitation. Low strength is a limitation for local roads and streets.

This map unit is in capability subclass IIIe and in woodland group 2o.

FrD—Fairmount-Rock outcrop complex, 12 to 30 percent slopes. This map unit consists of areas of Fairmount soils and Rock outcrop that are so intermingled that they could not be separated at the scale selected for mapping. The Fairmount soils are shallow, well drained, moderately steep to steep soils on narrow ridges and hillsides and make up 30 percent of the map unit. Rock outcrop makes up 25 percent of the map unit. The areas of this unit are usually long and narrow and range from 2 to 50 acres in size.

Typically, Fairmount soils have a surface layer of very dark grayish brown flaggy silty clay loam about 8 inches thick. The subsoil, to a depth of 18 inches, is light olive brown flaggy silty clay. It is about 35 percent limestone fragments. Limestone bedrock is at a depth of about 18 inches.

Permeability is moderately slow or slow. The available water capacity is low. Natural fertility is medium and the content of organic matter is moderate. The root zone is shallow. This soil is neutral to moderately alkaline. Surface runoff is rapid. This soil is difficult to till because of common flagstones and shallowness to rock. Bedrock is between depths of 10 and 20 inches. The shrink-swell potential is moderate.

Included with these soils in mapping are small areas of Faywood and McAfee soils and areas of soils that are similar to Fairmount soils but are less than 10 inches deep to bedrock. These areas make up 45 percent of the map unit. In some areas, most of the loose rocks have been removed from the surface.

The soils in this map unit are mainly in unimproved pasture. Many areas have reverted to low-quality brush and woodland. The most common trees are redcedar, white oak, hickory, maple, black walnut, redbud, and locust.

These soils are poorly suited to cultivated crops because of the steepness of slopes, the very severe hazard of erosion, the shallowness to rock, and droughtiness. Common flagstones and rock outcrops make the use of machinery very difficult. Most crop yields are very low.

These soils are suited to pasture, but seedbed preparation and weed control are difficult because of the steepness of slopes, rock outcrops, and flagstones (fig. 7). Controlled grazing reduces the hazard of erosion. In areas that are too rocky and rough for the use of machinery, the soils can be used for pasture, but undesirable plants need to be controlled by spraying or hand cutting. Drought-resistant grasses and legumes grow best on these soils.

These soils are suited to use as woodland, but shallowness to rock and droughtiness limit tree growth. Suitable trees include eastern redcedar and Virginia pine. The main concerns in management are equipment limitations, the hazard of erosion, and seedling mortality. This unit is poorly suited to use as habitat for woodland wildlife.

This map unit is poorly suited to urban development because of the steepness of slopes, the high content of coarse fragments, rock outcrops, and the shallow depth to bedrock.

This map unit is in capability subclass VIs and in woodland group 4x.

FrF—Fairmount-Rock outcrop complex, 30 to 50 percent slopes. This map unit consists of areas of Fairmount soils and Rock outcrop that are so intermingled that they could not be separated at the scale selected for mapping. The Fairmount soils are shallow, well drained, and very steep. These soils are generally along bluff areas adjacent to major streams. They make up 35 percent of the map unit. Rock outcrop makes up 20 percent of the unit. The areas of this unit are usually long and narrow and range from 4 to 30 acres in size.

Typically, Fairmount soils have a surface layer that is very dark grayish brown flaggy silty clay loam about 8 inches thick. The subsoil, to a depth of about 18 inches, is light olive brown flaggy silty clay. It is about 35 percent limestone fragments. Limestone bedrock is at a depth of about 18 inches.

Permeability is moderately slow or slow. The available water capacity is low. Natural fertility is medium to low and the content of organic matter is moderate. The root zone is shallow. The soil is neutral to moderately alkaline. Surface runoff is rapid. This soil is difficult to till because of the steepness of slopes, common flagstones, and shallowness to bedrock. Bedrock is between depths of 10 and 20 inches. The shrink-swell potential is moderate.

Included with these soils in mapping are small areas of Faywood, McAfee, and Eden soils and areas of soils that are similar to Fairmount soils but are less than 10 inches deep to bedrock. Also included are areas of soils that are more than 20 inches deep to bedrock. The included soils make up 45 percent of the map unit. The colors and textures of the included soils are similar to those typical of Fairmount soils. In a few small areas the soils

Figure 7.—Pasture in an area of Fairmount-Rock outcrop complex, 12 to 30 percent slopes, and, in the background above the barn, in an area of McAfee silt loam, 6 to 12 percent slopes.

have more than 35 percent limestone fragments in the subsoil.

The soils in this map unit are mainly in brush or used as woodland. The most common trees are redcedar, white oak, hickory, maple, black walnut, redbud, and locust.

These soils are poorly suited to cultivated crops and to hay and pasture because of the steepness of slopes, shallowness to rock, droughtiness, and common flagstones and outcrops of rock, and because erosion is a very severe hazard. They are better suited to use as woodland and as habitat for woodland wildlife; however, the potential for wildlife habitat is poor.

These soils are suited to use as woodland, but droughtiness and shallowness to rock limit tree growth. The main concerns in management are equipment limitations, the erosion hazard, and seedling mortality. Suitable trees include eastern redcedar and Virginia pine.

These soils are poorly suited to urban development because of very steep slopes, high content of coarse fragments, rock outcrops, and shallow depth to bedrock.

This map unit is in capability subclass VIIs and in woodland group 4x.

FwB—Faywood silt loam, 2 to 6 percent slopes. This is a moderately deep, well drained, gently sloping soil on moderately broad to narrow ridges. Slopes are generally smooth and convex. The areas range from 3 to 30 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is dark yellowish brown silty clay loam to a depth of 11 inches. Below that, to a depth of 19 inches, it is brown silty clay, and to a depth of 34 inches, it is yellowish brown clay. Bedrock is at a depth of 34 inches.

Permeability is moderately slow or slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep. This soil is neutral to strongly acid. Surface runoff is medium. The soil has good tilth and can be worked within a wide range of moisture content without clodding or crusting. The depth to bedrock ranges from 20 to 40 inches; it is generally about 34 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Cynthiana, Eden, Lowell, Lowell Variant, Maury, McAfee,

and Nicholson soils. The included soils make up about 10 to 15 percent of this map unit. The areas of the individual soils generally are less than 3 acres in size.

This soil is used for cultivated crops, small grains, pasture, and hay crops. It is suited to cultivated crops, and under good management, it produces moderate yields. The hazard of erosion is moderate when this soil is cultivated. Some practices that maintain good tilth, reduce runoff, and control erosion are use of cover crops, returning crop residue to the soil, including grasses and legumes in the cropping system, and using minimum tillage.

This soil is well suited to most of the hay and pasture plants commonly grown in the area. Proper stocking rates to maintain desired pasture plants and controlled grazing are the main concerns in management.

This soil is suited to use as woodland, and in a few areas it is wooded. Suitable trees include shortleaf pine, black locust, loblolly pine, and eastern redcedar. Controlling plant competition by cultivation or other methods is often required until tree seedlings are established.

This soil is suited to most urban uses. The main limitations are the moderate shrink-swell potential, moderate depth to bedrock, and moderately slow or slow permeability.

This map unit is in capability subclass IIe and in woodland group 3c.

FwC—Faywood silt loam, 6 to 12 percent slopes. This is a moderately deep, well drained, sloping soil on narrow ridges and in long, narrow areas generally below broad areas of gently sloping Lowell, Lowell Variant-Nicholson complex, and Nicholson soils. Slopes are generally smooth. The areas are 5 to 150 acres in size. Shallow drainageways and rock outcrops are common.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is dark yellowish brown silty clay loam to a depth of 11 inches. Below that, to a depth of 19 inches, it is brown silty clay, and to a depth of 34 inches, it is yellowish brown clay. Bedrock is at a depth of 34 inches.

Permeability is moderately slow or slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep. This soil is neutral to strongly acid. Surface runoff is medium to rapid. Except in severely eroded spots, the soil has good tilth and is moderately easy to work within a wide range of moisture content. The depth to bedrock ranges from 20 to 40 inches, but is generally about 34 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Cynthiana, Eden, Lowell, Lowell Variant, Nicholson, Maury, and McAfee soils and a few areas of soils that are severely eroded. The included soils make up about 10 to 20 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for hay and pasture. On the smaller farms and in the Eden Hills section of Nicholas County, it is used for row crops and small grains. It is suited to cultivated crops, and under good management it produces moderate yields. The risk of erosion is severe when this soil is cultivated. Erosion can be a serious problem with continuous cultivation and inadequate conservation practices. Good tilth can be maintained by including grasses and legumes in the cropping system, use of cover crops, and returning crop residue to the soil. These practices and others such as contour cultivation, minimum tillage, and stripcropping reduce runoff and help to control erosion. Deep-rooted crops are restricted by bedrock at a depth of about 34 inches.

This soil is well suited to pasture and hay crops. Pasture grasses and legumes that are resistant to drought grow best on this soil. A good program of liming and fertilizing is needed for high production. The main management needs are proper seeding rates and mixtures, weed control, and controlled grazing to prevent overgrazing.

This soil is suited to use as woodland. Trees that are suitable are shortleaf pine, loblolly pine, black locust, eastern redcedar, and eastern white pine. Controlling plant competition by cultivation or other suitable methods is generally required until tree seedlings are established.

This soil is suited to most urban uses. Steep slopes, the moderate shrink-swell potential, moderately slow or slow permeability, and moderate depth to bedrock are the main limitations.

This map unit is in capability subclass IIIe and in woodland group 3c.

FyD—Faywood silty clay loam, 12 to 20 percent slopes. This is a moderately deep, well drained, moderately steep soil on narrow ridges and in long narrow areas generally below less sloping Faywood soils. The ridgetops are very narrow. The areas range from 3 to 25 acres in size. Where this soil makes up the entire side slope and drainageway, the areas are much larger, extending to 100 acres or more.

Typically, the surface layer is brown silty clay loam about 7 inches thick. The subsoil is yellowish brown silty clay or clay to a depth of 24 inches. The substratum to a depth of about 29 inches is pale brown flaggy clay. Bedrock is at a depth of about 29 inches.

Permeability is moderately slow or slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate to low. The root zone is moderately deep. This soil is neutral to strongly acid. Surface runoff is medium or rapid. The depth to bedrock ranges from 20 to 40 inches, but is generally about 29 inches. Tilth is fair. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Cynthiana, Eden, and McAfee soils. Also included are

areas of soils where the surface layer is 8 to 12 inches thick, areas of soils that are more than 40 inches deep to rock, and, in hilly topography that is dissected by many drainageways, areas of severely eroded soils with shallow gullies and common rock outcrops. The included soils make up 10 to 15 percent of this map unit, but the areas of the individual soils generally are less than 5 acres in size.

This soil is mainly in grass or brush or is used as woodland. It is poorly suited to cultivated crops because of the moderately steep slopes and very severe erosion hazard. Cultivated crops can be grown occasionally, provided adequate measures are taken to control erosion. Some practices that reduce runoff and help to control erosion are minimum tillage, stripcropping, contour tillage, including grasses and legumes in the cropping system, and returning crop residue to the soil. Most of these practices also help to maintain and improve tilth and the supply of organic matter.

This soil is suited to pasture and hay crops. Because of the moderately steep slopes and very severe erosion hazard, managing vegetation for ground cover and soil protection is most important. Proper stocking rates, rotational grazing, and controlling undesirable vegetation are some of the chief management needs. When this soil is wet, overgrazing compacts the silty clay loam surface layer, increases runoff, and causes excessive soil loss by erosion.

This soil is suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, eastern white pine, black locust, and eastern redcedar. The hazard of erosion, equipment limitations, and seedling mortality are the main concerns in management.

This soil is poorly suited to most urban uses because of steep slopes, moderate depth to rock, the moderate shrink-swell potential, and moderately slow or slow permeability.

This map unit is in capability subclass IVe and in woodland group 3c.

La—Lawrence silt loam. This is a deep, somewhat poorly drained, nearly level soil on stream terraces, fans, and concave uplands. The areas range from 5 to 25 acres in size. Slope ranges from 0 to 2 percent.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 29 inches, is light olive brown and brown silty clay loam mottled in shades of gray and brown. In the lower part, to a depth of about 48 inches, it is mottled yellowish brown and light gray silty clay loam that is a very firm and compact fragipan. The substratum to a depth of about 66 inches is very pale brown silty clay.

Permeability is slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is low. Unless this soil is limed, it is slightly acid to very strongly acid above the fragipan. The root zone is moderately deep and is restricted by the fragipan at about 29 inches. Surface runoff is slow. The plow layer has good tilth, but because of slow internal drainage and surface drainage, it is generally late in spring before tillage is possible. A perched high water table is between depths of 1 and 2 feet in winter and early in spring. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Nolin, Lindside, Newark, and Dunning soils on floodplains; areas of Elk and Otwell soils on stream terraces; and areas of Lowell, Lowell Variant, and Nicholson soils on uplands. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for corn, soybeans, hay, and pasture crops. It is suited to most cultivated crops if it is drained. It is poorly suited to water-sensitive crops, such as alfalfa and tobacco, because of the seasonal high water table and because water tends to pond in low areas. Wetness commonly delays spring planting. For maximum production this soil should be tile drained or open ditches should be dug to remove excess water. Some practices that help to increase and maintain yields are minimum tillage, use of cover crops, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is suited to pasture and hay crops. Shallow-rooted pasture grasses and legumes that can tolerate moderate wetness are best adapted. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing. In wet seasons livestock should be removed when the soil is saturated, to avoid compaction of the surface layer and prevent damage to the plants.

This soil is well suited to use as woodland, but few areas are wooded. Suitable trees include yellow-poplar, white ash, loblolly pine, and American sycamore. The use of equipment for planting, managing, and harvesting is restricted during wet seasons. Controlling plant competition by cultivation or weeding by other methods is required until tree seedlings are established.

This soil is poorly suited to most urban uses because of the hazard of rare flooding, the seasonal high water table, and slow permeability.

This map unit is in capability subclass IIIw and in woodland group 2w.

Ln—Lindside silt loam. This is a deep, moderately well drained, nearly level soil in narrow bands along streams throughout the survey area. The areas are from 3 to 95 acres in size. Slope ranges from 0 to 2 percent.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 28 inches, is brown silt loam. The lower part, to a depth of 36 inches, is light olive brown silty clay loam with olive, olive brown, and yellowish brown mottles. The substratum to a depth of 60 inches is light brownish gray silty clay loam with grayish brown and yellowish brown mottles.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by roots. This soil is medium acid to mildly alkaline. Surface runoff is slow. This soil is easy to till. A high water table is at a depth of 1.5 to 3 feet in winter and early in spring. This soil is subject to frequent flooding.

Included with this soil in mapping are small areas of Nolin, Newark, and Dunning soils on flood plains and Allegheny, Elk, and Otwell soils on low stream terraces. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for hay and pasture. To some extent it is used for cultivated crops and small grains. It is well suited to most of the cultivated crops commonly grown in the area. A seasonal high water table delays cultivation early in spring. Some practices that help to insure continued high crop yields are minimum tillage, use of cover crops, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Incorporating crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. A permanent protective vegetative cover reduces erosion in drainageways.

This soil is well suited to most of the hay and pasture plants commonly grown in the area. Grasses and legumes that can tolerate slight wetness and brief flooding in winter and spring are best adapted to this soil. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland. In a few areas it is wooded. Suitable trees include eastern white pine, yellow-poplar, black walnut, and white ash. Controlling plant competition is the main concern in management.

This soil is poorly suited to most urban uses because of the seasonal high water table and frequent flooding.

This map unit is in capability class I and in woodland group 1o.

LoB—Lowell silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on broad ridges. The areas are generally smooth and convex and range from 5 to 100 acres in size. There are small sinkholes in a few areas.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 15 inches, is brown silty clay loam. The lower part, to a depth of 49 inches, is strong brown silty clay to yellowish brown silty clay and clay. Limestone bedrock is at a depth of about 49 inches.

Permeability is moderately slow. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep. Unless it is limed, this soil in the upper part is slightly acid to strongly acid. Surface runoff is slow to medium. The plow layer has good tilth and can be worked within a fairly wide range of moisture content without clodding or crusting. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Faywood, Lowell Variant, Maury, McAfee, and Nicholson soils. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 2 acres in size.

This soil is mainly used for cultivated crops (fig. 8), small grains, hay, and pasture (fig. 9). It is well suited to all the cultivated crops commonly grown in the area, and it produces high yields under good management. Erosion is a moderate hazard if cultivated crops are grown. Some practices that help to slow surface runoff and control erosion and to insure continued high crop yields are minimum tillage, contour tillage, stripcropping, terraces, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is well suited to all the hay and pasture plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland. Suitable trees include yellow-poplar, shortleaf pine, eastern white pine, Virginia pine, and loblolly pine. Controlling plant competition is the main concern in establishing woodland.

This soil is suited to most urban uses. The moderate shrink-swell potential of the clayey subsoil, depth to rock, and moderately slow permeability are the main limitations.

This map unit is in capability subclass IIe and in woodland group 2c.

LoC—Lowell silt loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil on narrow ridges and in long, narrow to fairly wide areas generally below broad areas of gently sloping Lowell, Lowell Variant-Nicholson complex, and Nicholson soils. There are small sinkholes in a few areas. In Nicholas County the areas are generally long and narrow and range from 2 to 100 acres in size. The areas in Bourbon County are generally broader and larger and range from 10 to 150 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 15 inches, is brown silty clay loam. The lower part, to a depth of 49 inches, is strong brown silty clay to yellowish brown silty clay and clay. Limestone bedrock is at a depth of about 49 inches.

Permeability is moderately slow. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is

Figure 8.—Tobacco harvest in an area of Lowell silt loam, 2 to 6 percent slopes, and, in the background, pasture in an area of Faywood silt loam, 6 to 12 percent slopes.

deep. Unless it is limed, this soil in the upper part is slightly acid to strongly acid. Surface runoff is medium. This soil has good tilth and can be worked within a fairly wide range of moisture content without the soil clodding or crusting, except in small areas where it is severely eroded and the clayey subsoil is closer to the surface. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Cynthiana, Eden, Faywood, Lowell Variant, Maury, and McAfee soils. Also included are small areas of soils that are reddish brown in the upper part of the subsoil, and small areas of soils with slopes of more than 12 percent. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for cultivated crops, small grains, hay, and pasture. This soil is well suited to all the cultivated crops commonly grown in the area, and it produces high yields under good management. Erosion is a severe hazard if this soil is cultivated. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and to control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. A permanent protective vegetative cover reduces erosion in drainageways.

This soil is well suited to all the pasture and hay plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland. Suitable trees include eastern white pine, yellow-poplar, shortleaf pine, loblolly pine, and Virginia pine. Controlling plant competition is the main concern in establishing woodland.

This soil is suited to most urban uses. Steep slopes, the moderate shrink-swell potential of the clayey subsoil, depth to rock, and the moderately slow permeability are the main limitations.

This map unit is in capability subclass IIIe and in woodland group 2c.

LvC—Lowell Variant silt loam, 6 to 12 percent slopes. This is a deep, moderately well to somewhat poorly drained, sloping soil in long narrow areas below gently sloping Lowell, Lowell Variant-Nicholson complex, and Nicholson soils. The areas are moderately smooth or moderately dissected and range from 2 to 38 acres in size.

Typically, the surface layer is brown silt loam about 7

Figure 9.—Pasture in an area of Lowell silt loam, 2 to 6 percent slopes.

inches thick. The upper part of the subsoil, to a depth of 18 inches, is yellowish brown silty clay loam. The middle part, to a depth of 23 inches, is yellowish brown silty clay with light gray through strong brown mottles. The lower part, to a depth of 50 inches, is light yellowish brown clay with light brownish gray through strong brown mottles. The substratum is light yellowish brown clay with gray mottles. It is interbedded with soft siltstone and shale.

Permeability is slow. The available water capacity is high. Natural fertility is medium, and the content of organic matter is low. The root zone is deep, but it is somewhat restricted by the sticky and plastic clayey subsoil. This soil is mildly alkaline to strongly acid. Surface runoff is medium to rapid. The plow layer has good tilth, but cultivation may be delayed early in spring by a seasonal high water table between depths of 1.5 and 2.5 feet. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Elk, Lowell, Maury, Faywood, and Nicholson soils, and a few areas of soils that are severely eroded. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for pasture and hay crops. In a few areas it is used for cultivated crops. This soil is suited to most cultivated crops commonly grown in the area, and it produces moderate yields under good management. A seasonal high water table often delays planting early in spring. Water-sensitive crops, for example, alfalfa, are not suitable because of the seasonal high water table. Tilling within the suitable range in moisture content helps to maintain good tilth

and soil structure. Erosion is a severe hazard when this soil is cultivated. Some practices that help to slow surface runoff and control erosion are minimum tillage, contour tillage, stripcropping, terraces, use of cover crops, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is well suited to pasture and hay crops. It is suited to a wide variety of hay and pasture plants, and it produces high yields under good management. Plants should be selected that can tolerate moderate wetness caused by a seasonal high water table. Controlled grazing prevents damage to plants and compaction when the soil is wet. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, yellow-poplar, and eastern white pine. Controlling plant competition is the main concern in establishing woodland.

This soil is suited to most urban uses. The seasonal high water table, steepness of slopes, slow permeability, and the moderate shrink-swell potential of the clayey subsoil are the main limitations.

This map unit is in capability subclass IIIe and in woodland group 2c.

LwB—Lowell Variant-Nicholson complex, 2 to 6 percent slopes. This map unit consists of gently sloping Lowell Variant and Nicholson soils on broad uplands and, to a lesser extent, along drainageways and low-lying areas above the flood plain. The Lowell Variant soils are deep and are moderately well drained or somewhat poorly drained. The Nicholson soils are deep and moderately well drained and have a fragipan in the subsoil at a depth of about 24 inches. These soils are so intermingled that they could not be separated at the scale selected for mapping. The areas of these soils range from 2 to 100 acres or more in size.

About 53 percent of this map unit is Lowell Variant soils. Typically, the surface layer is brown silt loam about 7 inches thick. The upper part of the subsoil, to a depth of 18 inches, is yellowish brown silty clay loam. The middle part, to a depth of 23 inches, is yellowish brown silty clay with light gray through strong brown mottles. The lower part, to a depth of 50 inches, is light yellowish brown clay with light brownish gray through strong brown mottles. It is interbedded with soft siltstone and shale.

Permeability is slow. The available water capacity is high. Natural fertility is medium, and the content of organic matter is low. The root zone is deep and is somewhat restricted by the sticky and plastic clayey subsoil. These soils are strongly acid to mildly alkaline. Surface runoff is medium. The plow layer has good tilth, but cultivation may be delayed early in spring because of a seasonal high water table between depths of 1.5 and 2.5 feet. The shrink-swell potential is moderate in the clayey subsoil.

About 27 percent of this map unit is Nicholson soils. Typically, the surface layer is brown silt loam about 10 inches thick. The upper part of the subsoil, to a depth of 24 inches, is brown silty clay loam. The next layer, to a depth of 44 inches, is a firm and compact fragipan that is yellowish brown silty clay loam with light gray through strong brown mottles. The lower part to a depth of 80 inches is mottled yellowish brown, light gray, and pale brown clay.

Permeability is slow in the fragipan and moderate above the fragipan. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep and is restricted by the fragipan at about 24 inches. Except where it is limed, this soil is slightly acid to strongly acid from the surface to below the fragipan. Surface runoff is medium. The plow layer has good tilth, but cultivation may be delayed early in spring because of a seasonal high water table between depths of 1.5 and 2.5 feet. The shrink-swell potential is moderate below the fragipan.

Included with these soils in mapping are small areas of Elk, Lowell, Faywood, Dunning, Lawrence, and Maury soils. The included soils make up about 20 percent of the map unit, but the areas of the individual soils are generally less than 3 acres.

These soils are mainly used for cultivated crops, small grains, pasture, and hay crops. They are well suited to most cultivated crops commonly grown in the area, and they produce high yields under good management. Water-sensitive crops, for example, tobacco and alfalfa, are less suitable because of the seasonal high water table. The seasonal high water table often delays planting or seeding early in spring. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

These soils are well suited to a wide variety of hay and pasture plants, and they produce high yields under good management. Plants should be selected that tolerate moderate wetness caused by a seasonal high water table. When these soils are wet, controlled grazing prevents plant damage and compaction of the surface layer. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

These soils are well suited to use as woodland. In a few areas they are wooded. Suitable trees for Nicholson soils include black walnut, yellow-poplar, eastern white pine, shortleaf pine, and white ash. Suitable trees for Lowell Variant soils include yellow-poplar, eastern white

pine, and shortleaf pine. Controlling plant competition is the main concern in establishing trees on these soils.

These soils are suited to most urban uses. Slow permeability and wetness are the main limitations. The shrink-swell potential of the clayey subsoil in Lowell Variant soils and in the subsoil below the fragipan in Nicholson soils also limits the use of these soils for some urban uses.

This map unit is in capability subclass IIe. Lowell Variant soils are in woodland group 2c, and Nicholson soils are in woodland group 2o.

MaA—Maury silt loam, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil on broad ridges in the central part of Bourbon County. The areas are generally round to oblong and range from 5 to 55 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is dark brown silt loam. The next layer, from 16 to 24 inches, is reddish brown silty clay loam, and below that, to a depth of 46 inches, is yellowish red silty clay. The lower part of the subsoil to a depth of 69 inches is dark brown clay.

Permeability is moderate or moderately rapid. Available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by all roots. Unless it is limed, this soil is slightly acid to strongly acid. Surface runoff is slow. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are a few areas with slopes of more than 2 percent. The included areas make up 5 to 10 percent of this map unit, but the areas of the individual soils are generally less than 3 acres.

In most areas, this map unit is used for cultivated crops, small grains, hay, and pasture. This soil is well suited to all of the cultivated crops commonly grown in the area. This soil produces high yields under good management. Practices are required that will maintain the supply of organic matter, good tilth, and continued high crop yields. Some practices that are effective are stubble mulching, returning crop residue to the soil, planting winter cover crops, using minimum tillage, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs.

This soil is well suited to all of the pasture and hay plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is well suited to use as woodland, but all of this map unit is farmed. Suitable trees include black walnut, yellow-poplar, white ash, eastern white pine, and shortleaf pine. Control of plant competition in establishing tree seedlings is the main concern in management.

This soil is well suited to most urban uses. Low strength is a limitation for local roads and streets. The clayey texture of the subsoil and the moderate or moderately rapid permeability are limitations that affect some uses.

This map unit is in capability class I and in woodland group 2o.

MaB—Maury silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on broad ridges in Bourbon County and in Nicholas County west of Carlisle. The areas range from 5 to several hundred acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is dark brown silt loam. The next layer, to 24 inches, is reddish brown silty clay loam, and below that, to a depth of 46 inches, is yellowish red silty clay. The lower part of the subsoil to a depth of 69 inches is dark brown clay. The underlying limestone is cavernous.

Permeability is moderate or moderately rapid. Available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by roots. Unless it is limed, this soil is slightly acid to strongly acid. Surface runoff is medium. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting.

Included with this soil in mapping are small areas of Lowell, Lowell Variant, Faywood, and McAfee soils. Also included are some small areas of soils that have subsoil mixed with the surface layer because of erosion and plowing, and a few small areas of soils that are yellowish brown and brown in the lower part of the subsoil. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for cultivated crops, small grains, hay, and pasture. It is well suited to all of the cultivated crops commonly grown in the area, and it produces high yields under good management. Corn, tobacco, and alfalfa are the most commonly grown crops. In a few areas, cultivated varieties of grapes have been successfully grown on this soil. Erosion is a moderate hazard if this soil is cultivated. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is well suited to all of the hay and pasture plants commonly grown in the area. The main management needs are proper seeding rates and

mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is well suited to use as woodland, but most of it is farmed. Suitable trees include black walnut, yellow-poplar, white ash, eastern white pine, and shortleaf pine. Control of plant competition in establishing tree seedlings is the main concern in management.

This soil is well suited to most urban uses. Low strength is a limitation for local roads and streets. The clayey subsoil and the moderate or moderately rapid permeability are limitations that affect some uses.

This map unit is in capability subclass IIe and in woodland group 2o.

MaC—Maury silt loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil in long, narrow areas generally below broad areas of less sloping soils in Bourbon County and in Nicholas County west of Carlisle. Some areas have karst topography. The areas range from 2 to 135 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is dark brown silt loam. The next layer, from 16 to 24 inches, is reddish brown silty clay loam, and below that, to a depth of 46 inches, is yellowish red silty clay. The lower part of the subsoil to a depth of 69 inches is dark brown clay. The underlying limestone is cavernous.

Permeability is moderate or moderately rapid. Available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by roots. Unless it is limed, this soil is slightly acid to strongly acid. Surface runoff is medium. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting. Strength is low.

Included with this soil in mapping are small areas of Lowell, Faywood, and McAfee soils. Also included are small areas of soils that are severely eroded, have a reddish brown surface layer, and are less than 50 inches deep to bedrock. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for cultivated crops, small grains, hay, and pasture. It is well suited to all of the cultivated crops commonly grown in the area, and it produces high yields under good management. When this soil is cultivated, the hazard of erosion is severe. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are minimum tillage, contour tillage, terraces, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporation of crop residue into the plow layer helps to maintain good tilth and the supply of organic matter. Drainageways need to be kept in permanent protective vegetative cover to reduce erosion.

This soil is well suited to all the pasture and hay plants commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is well suited to use as woodland, but few areas are wooded. Suitable trees include black walnut, yellow-poplar, white ash, eastern white pine, and shortleaf pine. Control of plant competition in establishing tree seedlings is the main concern in management.

This soil is suited to most urban uses. Low strength, steepness of slopes, moderate or moderately rapid permeability, and clayey textures in the subsoil are limitations for some uses.

This map unit is in capability subclass IIIe and in woodland group 2o.

McB—McAfee silt loam, 2 to 6 percent slopes. This is a moderately deep, well drained, gently sloping soil on broad ridges and to a lesser extent on toe slopes in Bourbon County and in Nicholas County west of Carlisle. The areas range from 2 to 55 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 21 inches, is dark brown silty clay loam. The lower part of the subsoil, to a depth of 32 inches, is reddish brown silty clay. Limestone bedrock is at a depth of about 32 inches.

Permeability is moderately slow. The available water capacity is moderate. Natural fertility is medium to high, and the content of organic matter is moderate. The root zone is moderately deep. This soil is medium acid to neutral. Surface runoff is slow to medium. This soil has good tilth and can be worked within a wide range of moisture content without clodding or crusting. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Maury, Lowell, Lowell Variant, Elk, Faywood, and Fairmount soils. Also included are small areas of soils that are similar to McAfee soils; in these areas, however, the soils are less than 20 inches deep to bedrock and have occasional rock outcrops and large boulders. Included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

Most of this map unit is used for cultivated crops, small grains, hay, and pasture. This soil is well suited to all the cultivated crops commonly grown in the area. It produces moderate yields under good management. The hazard of erosion is moderate, but control of erosion is a major concern if cultivated crops are grown. Some practices that help to slow surface runoff, control erosion, and maintain crop yields are minimum tillage, stripcropping, contour tillage, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. Keeping crop residue on or near the surface also helps

to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is well suited to the hay and pasture plants commonly grown in the area (fig. 10). The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is suited to use as woodland, but most of this map unit is farmed. Suitable trees include eastern redcedar, eastern white pine, yellow-poplar, black walnut, black locust, and shortleaf pine. Control of plant competition in establishing tree seedlings is the main concern in management.

This soil is suited to urban uses. The main limitations are moderate depth to bedrock, moderately slow permeability, and the moderate shrink-swell potential of the clayey subsoil.

This map unit is in capability subclass IIe and in woodland group 3c.

McC—McAfee silt loam, 6 to 12 percent slopes. This is a moderately deep, well drained, sloping soil. It is mainly on low-lying hills and irregular side slopes in areas of karst topography in Bourbon County and in Nicholas County west of Carlisle. The areas range from 3 to 45 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 21 inches, is dark brown silty clay loam. The lower part, to a depth of 32 inches, is reddish brown silty clay. Limestone bedrock is at a depth of about 32 inches.

Permeability is moderately slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep. This soil is medium acid to neutral. Surface runoff is medium to rapid. This soil has good tilth and can be worked within a wide range of moisture content without clodding or crusting. Bedrock is between depths of 20 and 40 inches. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Lowell, Maury, Faywood, Cynthiana, and Fairmount soils. Also included are small areas of soils that are similar to McAfee soils but are less than 20 inches deep to bedrock and have occasional outcrops of rock and large boulders. The soils in a few areas are severely eroded. The included soils make up 10 to 15 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

Figure 10.—Pasture and horse farm buildings in an area of McAfee silt loam, 2 to 6 percent slopes, and McAfee silt loam, 6 to 12 percent slopes.

This soil is mainly used for cultivated crops, small grains, and hay and pasture. It is suited to most cultivated crops; under good management it produces moderate yields. Erosion is a severe hazard if the soil is cultivated, and this is a main concern in management. Some practices that help to slow surface runoff and control erosion and to maintain crop yields are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and fertilizing and liming according to crop needs. In a few small areas, the soil is severely eroded and is shallow to bedrock. In those areas, the soil should be kept in permanent protective vegetative cover.

This soil is well suited to the grasses and legumes commonly grown in the area. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, weed control, and controlled grazing.

This soil is well suited to use as woodland, but few areas are wooded. Suitable trees include eastern white pine, eastern redcedar, yellow-poplar, black walnut, black locust, and shortleaf pine. Controlling plant competition in establishing tree seedlings is the main concern in management for woodland.

This soil is suited to most urban uses. The main limitations are steepness of slopes, moderate depth to rock, moderately slow permeability, and the moderate shrink-swell potential of the clayey subsoil.

This map unit is in capability subclass IIIe and in woodland group 3c.

McD—McAfee silt loam, 12 to 20 percent slopes. This is a moderately deep, well drained, moderately steep soil in long, narrow areas generally below less sloping Maury and McAfee soils in Bourbon County and in Nicholas County west of Carlisle. The areas range from 5 to 40 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 21 inches, is dark brown silty clay loam. The lower part, to a depth of 32 inches, is reddish brown silty clay. Limestone bedrock is at a depth of about 32 inches.

Permeability is moderately slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep. This soil is medium acid to neutral. Surface runoff is medium to rapid. This soil has good tilth and can be worked within a wide range of moisture content without clodding or crusting. The depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Maury, Lowell, Faywood, Cynthiana, and Fairmount soils. Also included are small areas of soils that are similar to McAfee soils; in these areas, however, the soils are less than 20 inches deep to bedrock and have occasional rock outcrops and large boulders. In a few areas, the soils are severely eroded. The included soils make up 10 to 15 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly in grass, brush, or trees. Because of the moderately steep slopes and very severe erosion hazard, this soil is poorly suited to cultivated crops. It is suited to occasional use for cultivated crops, but if this soil is cultivated, measures to reduce runoff and control erosion are necessary. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, use of cover crops, and including grasses and legumes in the cropping system can help to reduce runoff and control erosion. Some of these practices also help to maintain good tilth and the supply of organic matter.

This soil is suited to pasture and hay crops. Yields are moderate if the soil is properly managed. The root zone ranges in depth from 20 to 40 inches, and lack of moisture sometimes limits yields during dry seasons. Plants should be selected that will produce adequate forage and provide satisfactory ground cover. Application of lime and fertilizer, proper seeding rates and mixtures, proper stocking rates, rotational grazing, and the control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland. The hazard of erosion, equipment limitations, and plant competition are concerns in management of woodland. Suitable trees include eastern white pine, eastern redcedar, yellow-poplar, black walnut, black locust, and shortleaf pine.

This soil is poorly suited to most urban uses, mainly because of steepness of slopes. Moderately slow permeability, moderate depth to bedrock, the moderate shrink-swell potential of the clayey subsoil, and low strength are limitations for some uses.

This map unit is in capability subclass IVe and in woodland group 3c.

Ne—Newark silt loam. This is a deep, somewhat poorly drained, nearly level soil on narrow flood plains along small streams and to a lesser extent in depressed areas on broad flood plains. The areas range from 3 to 15 acres in size. Slope ranges from 0 to 2 percent.

Typically, the surface layer is brown silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is grayish brown silt loam mottled with gray. The next layer, to a depth of 27 inches, is light brownish gray silty clay loam mottled in shades of gray and brown. Below that, to a depth of 40 inches, is dark grayish brown silty clay loam mottled in shades of brown. The substratum to a depth of 60 inches is brown silty clay loam mottled in shades of gray or brown.

Permeability is moderate. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by roots. This soil is neutral to slightly acid. Surface runoff is very slow. This soil has good tilth. It has a seasonal high water table at a depth of 0.5 to 1.5 feet during winter and early in spring, and it is subject to frequent flooding.

Included with this soil in mapping are small areas of Nolin, Lindside, and Dunning soils. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is dominantly used for hay and pasture. If it is artificially drained, it is well suited to most cultivated crops. It is poorly suited to winter crops because of a seasonal high water table and frequent flooding in winter and early in spring. Farming operations are often delayed because of excessive wetness and because the soil is slow to warm up and dry out in the spring. In this case, weed competition can become a serious problem. Tile drains and open ditches can improve internal drainage, and, in some places, ditches help to control surface runoff and overwash from adjacent soils. Where artificial drainage can be installed, it can lengthen the effective growing season, shorten the delay of farming operations, and widen the range of suitable plants. Tilth is improved and the supply of organic matter is maintained by returning crop residue to the soil, growing green manure cover crops, using minimum tillage, liming and fertilizing according to crop needs, and including grasses and legumes in the cropping system.

This soil is well suited to hay and pasture crops. Grasses and legumes should be selected that can tolerate wetness and withstand flooding for short periods. If it is drained, this soil is suited to a wide range of pasture plants. Overgrazing and grazing when the soil is saturated should be avoided. Grazing animals damage plants when the soil is saturated, and overgrazing results in a sparse cover of grasses and legumes and increases weed competition. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is well suited to use as woodland, but few areas are wooded. A seasonal high water table limits the use of equipment during wet seasons. Seedling mortality and the control of competitive plants are also concerns in management. Suitable trees include eastern cottonwood, sweetgum, post oak, loblolly pine, red maple, American sycamore, eastern white pine, and yellow-poplar.

This soil is poorly suited to most urban uses because of the frequent flooding hazard and wetness caused by the seasonal high water table.

This map unit is in capability subclass IIw and in woodland group 1w.

NfB—Nicholson silt loam, 2 to 6 percent slopes. This is a deep, moderately well drained, gently sloping soil on broad flat uplands and ridgetops. There is a fragipan in the subsoil at a depth of about 24 inches. The areas range from 5 to 100 acres in size.

Typically, the surface layer is brown silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 24 inches, is brown silty clay loam. Below that, to a depth of 44 inches, is a firm and compact fragipan that is yellowish brown silty clay loam with light gray through strong brown mottles. Below the fragipan to a depth of 80 inches is mottled yellowish brown, light gray, and pale brown clay.

Permeability is slow in the fragipan and moderate above the fragipan. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The root zone is moderately deep and is restricted by the fragipan at about 24 inches. Unless it is limed, this soil above and in the fragipan is slightly acid to strongly acid. Surface runoff is medium. The plow layer has good tilth, but cultivation may be delayed early in spring because of a perched water table at a depth of 1.5 to 2.5 feet. The shrink-swell potential is moderate below the fragipan.

Included with this soil in mapping are small areas of Eden, Faywood, Lowell, and Lowell Variant soils. Also included are small areas of soils that have a thick loess-like surface layer, are well to moderately well drained, and do not have a fragipan. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

Most of this map unit is in cultivated crops, small grains, and hay and pasture. This soil is well suited to most cultivated crops commonly grown in the area; with good management practices, it produces high yields. It is best suited to cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. The root zone is limited by a very firm and dense fragipan at a depth of about 24 inches. Because the fragipan limits available water capacity, this soil is sometimes droughty during dry seasons. The hazard of erosion is moderate, but control of erosion is a major concern of management when the soil is cultivated. Practices that will slow surface runoff and help control erosion and insure continued high crop yields are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps to maintain good tilth and the supply of organic matter.

This soil is well suited to most hay and pasture plants commonly grown in the area. Shallow-rooted and moderately deep-rooted grasses and legumes that can tolerate slight wetness are best adapted. Overgrazing should be avoided. A short or sparse cover of pasture plants increases the possibility of soil erosion and weed competition and makes it necessary to renovate the pasture to maintain production. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is suited to use as woodland. The control of competitive plants is the main concern in establishment of woodland. Suitable trees include black walnut, yellow-poplar, eastern white pine, shortleaf pine, and white ash.

This soil is suited to most urban uses. The seasonal high water table and slow permeability of the fragipan

are limitations that are difficult to overcome for some uses.

This map unit is in capability subclass IIe and in woodland group 2o.

No—Nolin silt loam. This is a deep, well drained, nearly level soil on flood plains along most streams and, to a lesser extent, in depressions on uplands. The areas range from 2 to 160 acres in size. Slope ranges from 0 to 2 percent.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil, to a depth of 49 inches, is brown silt loam. Below that, the substratum to a depth of 72 inches is grayish brown silty clay loam.

Permeability is moderate. The available water capacity is high. Natural fertility is high, and the content of organic matter is moderate. The root zone is deep and is easily penetrated by roots. The soil is mildly alkaline to medium acid throughout. Surface runoff is slow. The plow layer has good tilth and can be worked within a wide range of moisture content without clodding or crusting. This soil has a seasonal high water table at depths ranging from 3 to 6 feet, and it is subject to frequent flooding.

Included with this soil in mapping are small areas of Lindside, Dunning, Boonesboro, Newark, Allegheny, and Elk soils. Also included are small areas of soils that are similar to Nolin soils but have a sandy subsoil. The included soils make up 10 to 15 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for cultivated crops, small grains, and hay and pasture (fig. 11). It is well suited to cultivated crops, and yields are high under good management. The hazard of erosion is slight. This soil is poorly suited to winter crops because of the hazard of flooding in winter and early in spring. Runoff and overwash from adjacent soils in some areas can be reduced by constructing ditches near the foot of nearby hills to intercept the water. In some areas, improvement of the stream channel can reduce overflow. Drainage outlets in depressions should be kept open; if they are sealed, ponding can present a problem. A few low-lying areas are subject to flooding during the cropping season, and high-value crops such as tobacco are seldom grown in these areas. Some practices that help to maintain the supply of organic matter, maintain good tilth, and insure continued high crop yields are stubble mulching, returning crop residue to the soil, using mimimum tillage, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs.

This soil is well suited to most of the hay and pasture plants commonly grown in the area. Grasses and legumes that can withstand flooding of short duration are

Figure 11.—Pasture in an area of Nolin silt loam.

most suitable. Deferred grazing, control of grazing, and restricted grazing when the soil is wet are practices that can help to maintain pasture plants. Grazing before the plants are well established, overgrazing, and grazing when the soil is saturated damage the plants and result in thin cover, which increases the possibility of weed competition and the need for early renovation. Lime and fertilizer should be applied according to crop needs.

This soil is suited to use as woodland. Suitable trees include sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, cherrybark oak, and white ash. The control of competitive plants is the main concern in establishment of woodland.

This soil is poorly suited to most urban uses because of the hazard of frequent flooding.

This map unit is in capability class I and in woodland group 1o.

OtB—Otwell silt loam, 2 to 6 percent slopes. This is a deep, moderately well drained, gently sloping soil on low stream terraces and colluvial areas. The areas are usually round to oblong and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 12 inches thick. The upper part of the subsoil, to a depth of about 27 inches, is brown silty clay loam. Below that, to a depth of about 50 inches, there is a very firm and compact fragipan that is pale brown clay loam to silty clay loam with light gray and strong brown mottles. The substratum to a depth of about 74 inches is light brownish gray silty clay with strong brown and yellowish brown mottles.

Permeability is very slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is low to moderate. The root zone is moderately deep and is restricted by a fragipan at about 27 inches. This soil is neutral to very strongly acid. Surface runoff is slow to medium. Tilth is good, but cultivation may be delayed early in spring because of a perched water table at a depth of 1.5 to 2.5 feet. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Elk, Lawrence, Allegheny, Lowell Variant, Nolin, Lindside, and Newark soils. Also included are small areas of soils that have slopes of less than 2 percent and a few areas of soils that are not subject to flooding. The included soils make up 5 to 10 percent of this map unit, but the areas of the individual soils generally are less than 3 acres in size.

This soil is mainly used for corn, soybeans, small grains, and hay and pasture. This soil is well suited to most cultivated crops commonly grown in the area. Under good management it produces high yields. This soil is best suited to cultivated crops that have shallow to moderately deep roots and that can tolerate slight wetness. The root zone is limited by a very firm, dense fragipan at a depth of about 27 inches. Because the fragipan limits the available water capacity, this soil is often droughty during dry seasons. The hazard of erosion is moderate, but control of erosion is a major concern of management if this soil is cultivated. The soil responds well to lime and fertilizer. In some areas artificial drainage is needed to remove excess water. Practices that will slow surface runoff and help control erosion and insure continued high crop yields are minimum tillage, contour tillage, stripcropping, use of cover crops, including grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter.

This soil is well suited to most of the hay and pasture plants commonly grown in the area. Shallow-rooted and moderately deep-rooted plants that can tolerate slight wetness are best adapted. Overgrazing should be avoided at all times to avoid reducing the stand of desirable grasses and legumes. A short or sparse cover of pasture plants increases the possibility of soil erosion and weed competition and makes it necessary to renovate the pasture to maintain production. The main management needs are proper seeding rates and mixtures, use of lime and fertilizer, control of weeds, and control of grazing.

This soil is suited to use as woodland. Suitable trees include yellow-poplar, eastern white pine, and white ash. The control of competitive plants is the main concern in establishment of woodland.

This soil is poorly suited to most urban uses. Very slow permeability in the fragipan, rare flooding, and wetness are the main limitations. A few areas of included soils are not subject to flooding and are better suited to some urban uses.

This map unit is in capability subclass IIe and in woodland group 3o.

Pt—Pits-Dumps complex. This map unit consists of areas that have been disturbed by limestone mining. The areas are on uplands. They vary in shape and range from 15 to more than 30 acres in size.

Pits make up 50 to 75 percent of the map unit. These open excavations from which soil and other overburden have been removed support no plant life. The walls are vertical, and the flat bottoms are exposed limestone bedrock. The rock is blasted, removed, conditioned, and used for agricultural and industrial purposes, or it is stockpiled for future use.

Dumps make up 25 to 50 percent of the map unit. Dumps are piles of overburden, which is a mixture of about 60 percent rock (siltstone and shale) of all sizes and 40 percent soil material. The piles of overburden are 3 to 25 feet thick and can support little plant life without

major reclamation. The underlying limestone bedrock ranges from 25 to 100 feet in thickness. Slope ranges from 10 to 60 percent.

Two quarries in Bourbon County and one in Nicholas County, all of which are in production, are within the areas of this map unit. The soils in the area are Lowell, Faywood, Maury, McAfee, Cynthiana, and Fairmount soils.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and suitability of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the suitability and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Ronnie M. Rush, district conservationist, and Larry Crews, conservation agronomist, Soil Conservation Service, assisted in writing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 276,500 acres in the survey area were used for crops and pasture in 1967 (*3*). Of this total, 145,000 acres were used for permanent pasture; 28,400 acres for row crops, mainly corn and tobacco; 9,500 acres for close-grown crops, mainly wheat and barley; 73,800 acres for rotation hay and pasture; and 13,200 acres for hay. The rest of the acreage was mainly idle cropland and land in conservation use only.

The potential of the soils in Bourbon and Nicholas Counties for increased production of food is good. According to the 1970 Kentucky Soil and Water Conservation Needs Inventory, about 2,600 acres of potentially good cropland are currently used as woodland, about 56,500 acres as pasture, and about 1,300 acres as idle land and formerly cropped open land. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by applying the latest crop production techniques to all cropland in the area.

The acreage in crops and pasture has gradually decreased as more land is used for urban development. It was estimated that in 1967 there were about 6,000 acres of urban and built-up land in Bourbon and Nicholas Counties. Since 1967, urban and built-up areas have increased significantly. This soil survey can help in making land use decisions that can influence the future rate of farming in the survey area (See the section "General soil map units").

Soil erosion is the major soil problem on about 70 percent of the cropland and pasture in Bourbon and Nicholas Counties. If the slope is more than 2 percent, erosion is a hazard. Lowell Variant, Nicholson, and Otwell soils, for example, have slopes of more than 2 percent. These soils have an additional problem of wetness.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced if part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, for example, Lowell, Lowell

Variant, and Maury soils, and on soils that have a layer in or below the subsoil that limits the depth of the root zone, for example, a fragipan in Nicholson and Otwell soils or bedrock in Cynthiana, Eden, Fairmount, Faywood, and McAfee soils. Erosion also reduces the productivity of soils that tend to be droughty, for example, the moderately deep Faywood and McAfee soils. Loss of the surface layer through erosion also results in the pollution of streams by sediment. Polluted streams impair the quality of water for municipal, recreation, and livestock use and for fish and wildlife.

Erosion-control practices reduce damage from runoff and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can reduce soil losses by erosion to amounts that will not reduce the productive capacity of the soils. On livestock farms, the legume and grass forage crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

Terraces and diversions reduce the length of the slope and control runoff and erosion. They are most practical on deep, well-drained soils that have regular slopes, for example, Lowell and Maury soils. In a few areas, terraces have been constructed on moderately deep soils, such as Faywood and McAfee soils. Soils that have short and irregular slopes, such as Allegheny and Elk soils, moderately well drained soils, such as Lowell Variant soils, and soils that are shallow to bedrock, such as Cynthiana and Fairmount soils, are poorly suited to terraces. On the steeper soils in the survey area, where the narrow bottoms are cropped because cropland is limited, diversions are constructed to protect the bottoms from overflow from surrounding slopes. If the outlets for the terraces and diversions are not kept in permanent protective vegetation, erosion of the outlets can be excessive.

The trend in Bourbon and Nicholas Counties is toward erosion-control methods other than terraces and diversions, for example, contour farming, stripcropping, minimum or no tillage, and grasses and legumes in the cropping system.

Information on the design of erosion-control practices for each kind of soil in the survey area is available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on about 1 percent of the acreage used for crops and pasture in the survey area. Some soils are naturally so wet that the production of crops common to the area is generally not possible. These are mostly the very poorly to poorly drained Dunning soils, which make up about 2,280 acres in the survey area.

Without artificial drainage, soils that are somewhat poorly drained are so wet that crops are damaged in most years. In this category are Lawrence and Newark soils, which make up about 600 acres in the survey area. In most places, open-ditch drainage is needed to remove excess water that builds up on these soils because of nearly level slopes, and because of a fragipan in Lawrence soils.

Moderately well drained soils do not require tile drainage, but they may require open-ditch drainage so that water will not pond in depressed areas. These soils are Lowell Variant, Lindside, Nicholson, and Otwell soils, and they make up about 8,400 acres in the survey area. Crops should be selected that are tolerant of occasional wetness.

Information on drainage design for each kind of soil is available in local offices of the Soil Conservation Service.

The natural fertility of most soils in the survey area is medium. Soils on flood plains, for example, Boonesboro, Dunning, Lindside, Newark, and Nolin soils, are medium acid to mildly alkaline and have a higher content of plant nutrients than most soils on the uplands.

Most soils on the uplands are naturally strongly acid, and if they have never been limed, applications of ground limestone are necessary to raise the pH level sufficiently for good growth of alfalfa and other crops that grow only on nearly neutral soils. Maury soils are naturally high in phosphorus. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the desired yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils used for crops in the survey area have a surface layer that is grayish brown or brown silt loam and has a moderate content of organic matter. Most of the soils have good tilth and can be worked within a fairly wide range of moisture content without clodding or crusting. Once a crust forms on a soil, infiltration is reduced and runoff is increased. Regular additions of crop residue and manure can help to improve soil structure and prevent crust formation.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn, tobacco, and, to an increasing extent, soybeans are the main row crops. Other crops, including grain sorghum, potatoes, and sweet peppers can be grown if the market for them is favorable.

Wheat and barley are the common close-growing crops. Some rye and oats are grown. Red clover, fescue, orchardgrass, and timothy for seed are also grown to a limited extent.

Specialty crops grown commercially in the survey area are vegetables, small fruits, tree fruits, and nursery plants. A small acreage, scattered throughout the survey area, is in sweet potatoes, tomatoes, cucumbers, bush beans, head cabbage, squash, and muskmelons. There is one large vineyard in Bourbon County. Apples are the most important tree fruit grown in the survey area.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. Allegheny, Elk, Lowell, and Maury soils on slopes of less than 6 percent are in

this category. They make up about 77,290 acres in the survey area. Crops can generally be planted and harvested earlier on these soils than on other soils in the survey area.

Most of the well drained soils in the survey area are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor generally are poorly suited to early vegetables, small fruits, and orchards.

Information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management (*8*). The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Charles A. Foster, forester, Soil Conservation Service, assisted in writing this section.

Bourbon and Nicholas Counties are in the western Mesophytic forest region of the Deciduous Forest Formation of eastern North America. Forest land makes up 5 percent of Bourbon County, or 10,300 acres, and 21 percent of Nicholas County, or 27,000 acres. The oak-hickory forest type is the most extensive, making up 50 percent of the forest cover. The oak-pine forest type is second, making up 18 percent.

Most of the forest land is in small privately owned woodlots that, on the average, are 16 acres in size and essentially are unmanaged. Tree growth averages 33 cubic feet per acre per year, which is well below the 50 cubic feet or more that most stands could attain under high-level management.

At present the stands are not well stocked with trees of high commercial value, but with proper management, tree growth, stocking, and quality can be improved. This requires the removal of low-grade trees of little value in stands of all sizes as well as regeneration of sawtimber stands after harvest. This soil survey can be useful in identifying the most productive forest lands, soil limitations for management, and tree species to plant and to favor in existing stands.

There are no commercial sawmills, pallet mills, or similar mills in the survey area at the present time. In Nicholas County, two sawmills produce some rough lumber and do custom sawing. Logs and standing trees from the soil survey area are sold to mills producing lumber in adjoining counties.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index was calculated at 30 years of age for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the

surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

The wildlife population of Bourbon and Nicholas Counties consists of an estimated 37 species of mammals, 47 species of reptiles and amphibians, and 107 species of breeding birds. Probably many of the more than 200 other kinds of birds that visit Kentucky each year can be found in these counties during certain seasons.

The most important kinds of wildlife at present in Bourbon and Nicholas Counties are the gray squirrel, fox squirrel, raccoon, mink, muskrat, white-tailed deer, cottontail rabbit, bobwhite quail, and mourning dove. Although there is much overlap in the types of habitat required by these animals, the gray squirrel, fox squirrel, and white-tailed deer are classified mainly as woodland wildlife; the cottontail rabbit, bobwhite quail, and mourning dove as openland wildlife; and mink and muskrat, which spend much of their time in or near water, as wetland wildlife. Also included in this latter category are many nongame birds, such as the green heron and kingfisher, which feed on fish and other aquatic life.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places.

Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bluegrass, orchardgrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings and soil limitations are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the

limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated *poor* or *unsuited* as a source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as

construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel. Because of excess fines the soils in this survey area are not suitable sources of sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The soil limitations are given for pond reservoir areas and embankments, dikes, and levees.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable

compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering properties

Table 14 gives estimates of the engineering classification and of the range of properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either rippable or hard. If the rock is rippable, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*9*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Allegheny series

The Allegheny series consists of deep, well drained, moderately permeable soils that formed in old loamy alluvium. Allegheny soils are on low stream terraces and to a lesser extent on old stream terraces on high ridges along the Licking River in Nicholas County. Slope ranges from 2 to 20 percent.

On the low terraces Allegheny soils are associated with Elk, Nolin, and Otwell soils. Elk soils have a fine-silty control section. Nolin soils are on flood plains and lack an argillic horizon. Otwell soils have a fragipan. On the high terraces Allegheny soils are associated with Cynthiana, Faywood, Eden, and Lowell soils. Cynthiana,

Faywood, and Eden soils have a clayey subsoil and are not so deep. Lowell soils have a clayey subsoil.

Typical pedon of Allegheny loam, in an area of Allegheny loam, 2 to 6 percent slopes, in a field, 352 yards northeast of Licking River and 484 yards east of U.S. 68, about 12 miles north of Carlisle, in Nicholas County:

Ap—0 to 11 inches; dark yellowish brown (10YR 4/4) loam; weak fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.
B21t—11 to 20 inches; brown (7.5YR 5/4) loam; weak fine subangular blocky structure; friable; few fine roots; common clay films; strongly acid; gradual smooth boundary.
B22t—20 to 38 inches; strong brown (7.5YR 5/6) loam; few fine faint brown (10YR 5/3) and yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; friable; common clay films; very strongly acid; gradual smooth boundary.
B23t—38 to 53 inches; strong brown (7.5YR 5/6) clay loam; common medium distinct very pale brown (10YR 7/3) and yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; friable; common clay films; extremely acid; gradual smooth boundary.
B3—53 to 69 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/8) mottles; weak medium fine subangular blocky structure; friable; common clay films; extremely acid; gradual smooth boundary.
C—69 to 79 inches; strong brown (7.5YR 5/6) loam; massive; friable; extremely acid.

The solum is about 40 inches to more than 84 inches thick. The depth to bedrock is more than 60 inches. Content of pebbles ranges from 0 to 15 percent throughout the profile. Reaction ranges from strongly acid to extremely acid, unless the soil is limed.

The Ap horizon is 5 to 11 inches thick. It has value of 4 or 5 and chroma of 2 to 4. It is loam or fine sandy loam.

The B horizon is 36 to 75 inches thick. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Mottles, if present, are brown, pale brown, strong brown, or yellowish red. This horizon is loam in the upper part and clay loam in the lower part.

The C horizon has colors and textures similar to the B horizon. In a few pedons it is gravelly sandy loam.

Boonesboro series

The Boonesboro series consists of moderately deep, well drained soils that have moderately rapid permeability. They are nearly level or gently sloping soils on long, narrow flood plains of the smaller streams. They formed in alluvium derived primarily from limestone. Slope ranges from 0 to 4 percent. Boonesboro soils are subject to frequent flooding.

Boonesboro soils are on the same landscape as Nolin, Lindside, Dunning, Newark, Elk, and Otwell soils. Nolin and Lindside soils are deeper and have fewer coarse fragments. Elk soils are deeper and have an argillic horizon, and Otwell soils have a fragipan and few coarse fragments. Dunning soils are very poorly or poorly drained, and Newark soils are somewhat poorly drained.

Typical pedon of Boonesboro silt loam, in a field on the south side of Cassidy Creek Road, one-half mile southeast of Myers, 6 miles east of Carlisle, on Kentucky Highway 32 in Nicholas County:

Ap—0 to 12 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; very friable; many fine roots; dark brown (10YR 3/3) coatings on some peds; neutral; gradual smooth boundary.
B1—12 to 20 inches; dark yellowish brown (10YR 4/4) gravelly silty clay loam; moderate medium granular and fine subangular blocky structure; friable; common roots; 15 percent small gravel and 5 percent limestone fragments; neutral; clear smooth boundary.
B2—20 to 32 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak fine and medium granular structure; very friable; 30 percent gravel; 10 percent limestone channers; neutral.
R—32 inches; gray limestone.

The solum is 20 to 40 inches thick. The depth to limestone bedrock ranges from 20 to 40 inches. Limestone, chert, and siltstone fragments in the A horizon range from 0 to 20 percent by volume. In the B horizon they range from 15 to 75 percent but have an overall average of 35 percent or less. Reaction ranges from slightly acid to mildly alkaline.

The Ap horizon is 8 to 12 inches thick. It is silt loam, loam, or silty clay loam or their gravelly or flaggy analogs.

The B horizon is 16 to 24 inches thick. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is gravelly, cherty, or channery silt loam, silty clay loam, loam, or clay loam.

The Boonesboro soils in the survey area are taxadjuncts to the Boonesboro series. The surface horizon has color value one unit higher than is typical.

Cynthiana series

The Cynthiana series consists of shallow, well drained or somewhat excessively drained soils that have moderately slow permeability. These soils formed in residuum of weathered limestone or interbedded limestone and calcareous shale. The soils are on a hilly landscape or in short narrow areas bordering stream channels. Slope ranges from 6 to 35 percent.

Cynthiana soils are on the same landscape as Eden, Fairmount, Faywood, McAfee, and Lowell soils. All these

soils but Fairmount soils are more than 20 inches deep to bedrock. Fairmount soils have a mollic epipedon.

Typical pedon of Cynthiana silty clay loam, in an area of Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes, in a pasture 360 yards east of Stoner Creek, three-fourths of a mile west of junction of farm lane and Kentucky Highway 959, and 1 1/4 miles southwest of intersection of Kentucky Highway 959 and U.S. 460 in North Middletown, in Bourbon County:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine subangular blocky structure; friable; many fine roots; 5 percent thin flat fragments 6 to 15 inches long; neutral; clear smooth boundary.
B2t—6 to 16 inches; yellowish brown (10YR 5/4) silty clay; moderate fine angular blocky structure; very firm; few fine roots; common clay films; 20 percent thin flagstones mostly 6 to 15 inches long; neutral.
R—16 inches; limestone bedrock.

The solum is 10 to 20 inches thick. The depth to bedrock ranges from 10 to 20 inches. Limestone fragments in the surface layer range from 0 to 30 percent and in the subsoil from 5 to 35 percent. Reaction ranges from slightly acid to mildly alkaline.

The A horizon is 2 to 6 inches thick. It has hue of 2.5Y or 10YR and chroma of 2 through 4. It is silt loam or silty clay loam. In some pedons it is flaggy.

The B2t horizon is 7 to 16 inches thick. It has hue of 2.5Y or 10YR, and value of 4 or 5. It is silty clay, clay, or flaggy clay.

Dunning series

The Dunning series consists of deep, very poorly to poorly drained, slowly permeable soils that formed in slackwater alluvium. They formed in material derived chiefly from limestone. Slope is nearly level. Dunning soils are in depressions on flood plains and along stream heads.

Dunning soils are on a landscape similar to that of Nolin, Lindside, and Newark soils. Elk and Otwell soils are nearby on stream terraces. Dunning soils are more poorly drained than all these soils and have darker colored surface layers. Otwell soils are fine-silty and have a fragipan. Nolin, Lindside, and Newark soils are fine-silty. Elk soils are fine-silty and have an argillic horizon.

Typical pedon of Dunning silty clay loam in a pasture 4.5 miles south of intersection of U.S. 68 and U.S. 27 in Paris, 200 feet east of U.S. 27, and 500 feet north of main farm entrance road, in Bourbon County:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate fine and medium granular structure; friable; many fine roots; neutral; gradual smooth boundary.
A12—8 to 20 inches; black (5Y 2/1) silty clay loam; moderate medium granular structure; friable; common roots; neutral; clear smooth boundary.
Bg—20 to 48 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate fine granular structure; very firm; few fine roots in the upper part; common very dark gray ped coatings and mottles in the upper 6 inches; few small and medium dark brown concretions; neutral; gradual smooth boundary.
Cg—48 to 72 inches; dark gray (5Y 4/1) clay; many medium distinct strong brown (7.5YR 5/6) and pale olive (5Y 6/3) mottles; massive; firm, sticky and plastic; mildly alkaline.

The solum is 30 to 50 inches thick. The depth to bedrock ranges from 60 to more than 96 inches. The mollic epipedon is 15 to 24 inches thick. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

The A horizon is 15 to 24 inches thick. It has hue of 10YR through 5Y, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The average depth of the mollic epipedon is about 20 inches.

The Bg horizon is 10 to 28 inches thick. It has hue of 10YR through 5Y, value of 4 to 6, and chroma of 1 or 2. It ranges from silty clay loam to clay. Mottles in shades of brown are common throughout.

The Cg horizon has value of 4 or 5 and chroma of 1 or 0. It is silty clay or clay. Distinct mottles in shades of brown and olive are common.

Eden series

The Eden series consists of moderately deep, well drained, slowly permeable soils that formed in residuum of interbedded calcareous shale, siltstone, and limestone. They are on narrow ridgetops and hillsides. Slope ranges from 6 to 30 percent.

Eden soils are on the same landscape with Faywood, Lowell, Nicholson, and Cynthiana soils. Faywood soils are less than 40 inches deep to hard limestone. Lowell and Nicholson soils are more than 40 inches deep to hard limestone. Cynthiana soils are less than 20 inches deep to limestone.

Typical pedon of Eden silty clay loam in an area of Eden silty clay loam, 6 to 20 percent slopes, in a pasture 175 yards northwest of Plum Lick Road and 1 mile northeast of intersection of U.S. 460 and Plum Lick Road, about 12 miles southeast of Paris, in Bourbon County:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium granular structure; very friable; many fine roots; 3 percent siltstone fragments; slightly acid; clear smooth boundary.
B2t—5 to 20 inches; light olive brown (2.5Y 5/4) silty clay; moderate medium angular blocky structure;

firm, sticky and plastic; many fine roots; common clay films on ped faces; some organic staining between peds; 10 percent siltstone and weathered shale fragments; slightly acid; gradual smooth boundary.

B3—20 to 28 inches; light yellowish brown (2.5Y 6/4) flaggy silty clay; common fine faint light gray (10YR 7/2), pale brown (10YR 6/3), and yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; firm, sticky and plastic; few fine roots and pores; few small brown concretions; 20 percent limestone and shale fragments; moderately alkaline; clear smooth boundary.

Cr—28 to 50 inches; pale olive (5Y 6/3) clay and weathered interbedded shale, siltstone, and limestone.

The solum is 15 to 30 inches thick. The depth to paralithic contact ranges from 20 to 40 inches. Coarse fragments of limestone flagstones, siltstone, and shale in the A horizon range from 0 to 25 percent and in the B horizon from 10 to 35 percent. Some pedons have a C horizon that is 25 to 75 percent coarse fragments. Reaction ranges from medium acid to moderately alkaline.

The Ap horizon is from 3 to 7 inches thick but usually less than 5 inches thick. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is silt loam, silty clay loam, or silty clay or their flaggy analogs.

Some pedons have a B1 horizon less than 6 inches thick that is similar to the A horizon.

The B2t horizon is 8 to 17 inches thick. It has hue of 10YR through 5Y, value of 4 or 5, and chroma of 3 to 6. In some pedons there are few to common olive or strong brown mottles. This horizon is clay or silty clay or their flaggy analogs.

The B3 horizon is 0 to 8 inches thick. It has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 4 or 6. There are few to many gray, pale brown, and yellowish brown mottles. The B3 horizon is flaggy silty clay or flaggy clay that is sticky and plastic.

Elk series

The Elk series consists of deep, well drained, moderately permeable soils that formed in mixed alluvium from soils that developed in residuum of limestone, siltstone, and shale. Elk soils are on stream terraces along major streams. Some low-lying areas are flooded in winter and early in spring. Slope ranges from 0 to 12 percent.

Elk soils are on the same landscape with Nolin, Dunning, Lowell, Lindside, Newark, Allegheny, Lawrence, and Otwell soils. On higher elevations in Nicholas County, associated soils are Faywood and Eden soils. Nolin, Lindside, Dunning, and Newark soils are on flood plains and lack an argillic horizon. Otwell and Lawrence soils are less well drained and have a fragipan. Allegheny soils are more sandy and Lowell soils are more clayey in the subsoil. Faywood and Eden soils are less than 40 inches deep to rock.

Typical pedon of Elk silt loam in an area of Elk silt loam, 2 to 6 percent slopes, in a field 500 feet east of Licking River, three-fourths of a mile southwest of Wyatt-Lebus Road and private lane, 1 mile north of Ruddles Mill on Kentucky Highway 1940 and about 7 miles north of Paris, in Bourbon County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many roots; neutral; clear smooth boundary.

B1—8 to 13 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; common fine roots; few small brown concretions; few fine pores; slightly acid; gradual smooth boundary.

B21t—13 to 34 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; common fine roots; many clay films on ped faces; few fine pores; many fine black concretions; medium acid; gradual smooth boundary.

B22t—34 to 42 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; thin patchy clay films; common medium black concretions; medium acid; clear smooth boundary.

B3t—42 to 54 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; firm; slightly sticky and plastic; many large black concretions; 5 percent siltstone pebbles; strongly acid; gradual smooth boundary.

C—54 to 93 inches; yellowish brown (10YR 5/6) silty clay loam; massive; 8 percent fine pebbles; strongly acid.

The solum is 36 to 54 inches thick. The depth to bedrock ranges from 5 to 15 feet. Reaction ranges from medium acid to strongly acid throughout the solum, unless the soil is limed, and from slightly acid to strongly acid in the C horizon.

The A horizon ranges from 7 to 12 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam, loam, or silty clay loam.

The B horizon is 36 to 47 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay loam or silt loam. There are few to common mottles with chroma of 2 in the B22t and C horizons. The C horizon has the same color range as the B horizon. It is silt loam to silty clay loam and 0 to 25 percent gravel. In some pedons it is stratified fine sandy loam, loam, and clay loam.

Fairmount series

The Fairmount series consists of shallow, well drained, moderately slow to slowly permeable soils that formed in residuum of weathered limestone or limestone

interbedded with thin layers of calcareous shale. These soils are on narrow ridges, hillsides, and bluff areas adjacent to streams. Slope ranges from 12 to 50 percent.

Fairmount soils are on the same landscape as that of Cynthiana, Eden, Faywood, and McAfee soils. Cynthiana soils lack a mollic epipedon. Eden, Faywood, and McAfee soils are more than 20 inches deep to bedrock.

Typical pedon of Fairmount flaggy silty clay loam, in an area of Fairmount-Rock outcrop complex, 12 to 30 percent slopes, on the crest of a hill overlooking Strodes Creek, 20 yards south of Stony Point Road and large tobacco barn, about 2 miles east of U.S. 227, and about 7 miles south of Paris, in Bourbon County:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) flaggy silty clay loam; moderate medium granular structure; friable; 15 percent limestone flagstones and fragments; many roots; neutral; clear smooth boundary.
B2—8 to 18 inches; light olive brown (2.5Y 5/4) flaggy silty clay; moderate medium angular blocky structure; very firm, very sticky and very plastic; 35 percent limestone fragments; common fine roots; mildly alkaline; clear abrupt boundary.
R—18 inches; hard limestone.

The solum is 10 to 20 inches thick. The depth to bedrock ranges from 10 to 20 inches. Reaction ranges from neutral to moderately alkaline. Thin fragments make up about 10 to 35 percent of the solum.

The A horizon is 5 to 10 inches thick. It has value of 2 or 3 and chroma of 1 to 3. It is flaggy silty clay loam or flaggy silty clay.

The B2 horizon is 4 to 12 inches thick. It has hue of 10YR or 2.5Y and value of 4 or 5. It is silty clay, silty clay loam, or clay or their flaggy analogs.

The R horizon is thin layers of hard limestone or limestone interbedded with thin calcareous shale.

Faywood series

The Faywood series consists of moderately deep, well drained soils that have moderately slow to slow permeability. These soils formed mostly in residuum of interbedded limestone and shale or, in some areas, of limestone and shale interbedded with siltstone. These soils are on ridges and side slopes. Slope ranges from 2 to 35 percent.

Faywood soils are on the same landscape with Lowell Variant, Lowell, Maury, McAfee, Nicholson, Eden, and Cynthiana soils. The Lowell Variant, Lowell, and Maury soils are more than 40 inches deep to bedrock. Nicholson soils have a fragipan. McAfee soils are red and reddish brown in the B horizon. Eden soils have a paralithic contact and more coarse fragments. Cynthiana soils are less than 20 inches deep to bedrock.

Typical pedon of Faywood silt loam, in an area of Faywood silt loam, 2 to 6 percent slopes, located in a pasture about 528 feet north of farm lane which is 705 yards northeast of Kentucky Highway 1940, about 4 miles north of Paris, in Bourbon County:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.
B1—6 to 11 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; thin clay films on ped faces; neutral; clear smooth boundary.
B21t—11 to 19 inches; brown (7.5YR 4/4) silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; common clay films on ped faces; few fine black concretions; neutral; gradual smooth boundary.
B22t—19 to 34 inches; yellowish brown (10YR 5/4) clay; weak medium subangular blocky structure; firm, very sticky and plastic; few fine roots; thin clay films on ped faces; few fine black concretions; neutral; abrupt smooth boundary.
R—34 inches; limestone bedrock.

The solum is 20 to 40 inches thick. The depth to bedrock ranges from 20 to 40 inches. Limestone channers and flagstones make up 0 to 15 percent of the solum. Reaction ranges from neutral to strongly acid, except in the layer immediately above bedrock, where it ranges to mildly alkaline.

The Ap horizon is 5 to 8 inches thick. It has value of 4 or 5 and chroma of 2 or 3. It is silt loam or silty clay loam.

The B1 horizon is 2 to 6 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam.

The B2t horizon is 15 to 29 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay loam, silty clay, or clay. In some pedons mottles in shades of gray, olive, or brown are in the lower part of the horizon.

The C horizon, where present, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 or 6. It is silty clay or clay.

Lawrence series

The Lawrence series consists of deep, somewhat poorly drained, slowly permeable soils that formed in old mixed alluvium or colluvium from soils that formed in residuum of limestone, siltstone, sandstone, and shale. These soils are nearly level and are on stream terraces, fans, and concave uplands. They are saturated in winter and early in spring.

Lawrence soils are on the same landscape with Elk, Otwell, Nolin, Lindside, Lowell, Newark, Nicholson, Lowell Variant, and Dunning soils. Elk, Nolin, Lindside, Lowell, Lowell Variant, Newark, and Dunning soils do not have a fragipan. Nicholson and Otwell soils are better

drained and do not have gray mottles in the upper 10 inches of the argillic horizon.

Typical pedon of Lawrence silt loam, in a pasture 200 feet north of Kentucky Highway 956, one-fourth mile west of intersection of U.S. 227 and Kentucky Highway 956, and 1 mile north of Bourbon-Clark County Line, in Bourbon County:

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; common fine roots; few small brown concretions; neutral; gradual smooth boundary.

B21t—8 to 21 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and light gray (10YR 7/2) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots and pores; common clay films on peds; common medium black concretions; slightly acid; gradual smooth boundary.

B22t—21 to 29 inches; brown (10YR 5/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; firm; few fine roots and pores; common thin clay films and silt coatings on peds; medium acid; gradual smooth boundary.

Bx1—29 to 36 inches; mottled yellowish brown (10YR 5/6) and light gray (10YR 7/2) silty clay loam; moderate very coarse prismatic structure parting to moderate medium angular blocky; firm, compact and brittle; common clay films and silt coatings on prisms; few large black concretions; strongly acid; gradual wavy boundary.

Bx2—36 to 48 inches; light gray (10YR 7/1) silty clay loam; dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) common medium and coarse prominent mottles; moderate very coarse prismatic structure parting to moderate medium angular blocky; very firm, compact and brittle; continuous gray and brown silt coatings; small black concretions; very strongly acid; gradual wavy boundary.

IIC—48 to 66 inches; very pale brown (10YR 7/3) silty clay; common medium distinct strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4) mottles; massive; firm; few small brown concretions; very strongly acid.

The solum is 40 to 80 inches thick. The depth to bedrock ranges from 60 to 150 inches. Reaction ranges from slightly acid to very strongly acid above the Bx horizon and strongly acid to very strongly acid in and below it.

The A horizon is 6 to 12 inches thick. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The Bt horizon is 8 to 24 inches thick. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. There are few to many mottles with chroma of 2 or lower, and in some pedons there are also mottles in shades of brown. This horizon is silt loam or silty clay loam.

The Bx horizon is 12 to 25 inches thick. The matrix and mottles have hue of 2.5Y to 7.5YR, value of 5 to 7 and chroma of 1 to 6. In many pedons there are mottles in shades of gray and brown. This horizon is silt loam or silty clay loam. Nearly continuous gray clay films and silt or sand grains are on prisms and ped faces.

In some pedons the C horizon is stratified sand, silt, and clay below the fragipan.

Lindside series

The Lindside series consists of deep, moderately well drained, moderately permeable soils that formed in alluvium from soils that derived from weathered limestone, calcareous siltstone, and shale. Lindside soils are generally in narrow bands along streams and on flood plains and stream heads throughout the survey area. Slopes are less than 2 percent.

Lindside soils are on a landscape similar to that of Nolin, Newark, Otwell, Elk, Allegheny, and Dunning soils. Allegheny and Elk soils have an argillic horizon. Nolin soils are well drained. Newark soils are somewhat poorly drained. Dunning soils are very poorly to poorly drained and are more clayey. Otwell soils have a fragipan.

Typical pedon of Lindside silt loam in a bottom about one-half mile north of Kentucky Highway 956, about 1 1/4 miles east of Clintonville, about 12 miles south of Paris, in Bourbon County:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak very fine granular structure; friable; many roots; slightly acid; clear smooth boundary.

B1—8 to 18 inches; brown (10YR 4/3) silt loam; common fine faint yellowish brown (10YR 5/4) mottles; weak very fine and fine granular structure; friable; many roots; neutral; clear smooth boundary.

B2—18 to 28 inches; brown (10YR 4/3) silt loam; few fine faint distinct yellowish brown (10YR 5/4) and common medium faint distinct grayish-brown (10YR 5/2) mottles; weak very fine granular structure; friable; few roots; neutral; clear smooth boundary.

B3—28 to 36 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint olive brown (2.5Y 4/4) and common fine distinct olive gray (5Y 5/2) and dark yellowish brown (10YR 4/4) mottles; weak very fine granular structure; firm; many black concretions; neutral; gradual wavy boundary.

C—36 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine faint grayish brown (2.5Y 5/2) and common fine distinct dark grayish brown (2.5Y 4/2) and yellowish brown (10YR 5/6) mottles; massive; firm; slightly sticky and slightly plastic; many black concretions; neutral.

The solum is 30 to 40 inches thick. The depth to bedrock is more than 60 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon is 6 to 10 inches thick. It has value of 4 or 5 and chroma of 2 or 3.

The B horizon is 15 to 30 inches thick. It has hue of 10YR or 2.5Y, vlaue of 4 or 5, and chroma of 3 or 4. Mottles are in shades of gray or brown. This horizon is silt loam and silty clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. It is weakly stratified silty clay loam, silt loam, and loam.

Lowell series

The Lowell series consists of deep, well drained soils that have moderately slow permeability. These soils formed in residuum of weathered limestone or interbedded limestone, shale, and siltstone. Lowell soils are on ridgetops and side slopes. Slope ranges from 2 to 12 percent.

Lowell soils are on the same landscape as Maury, McAfee, Eden, Faywood, Cynthiana, Nicholson, and Lowell Variant soils. Maury soils have a thick reddish brown Bt horizon. Nicholson soils have a fragipan. Cynthiana, Eden, Faywood, and McAfee soils are less than 40 inches deep to rock. Lowell Variant soils have gray mottles in the upper 10 inches of the argillic horizon.

Typical pedon of Lowell silt loam, in an area of Lowell silt loam, 2 to 6 percent slopes, in a pasture 325 feet east of intersection of U.S. 27 and Townsend Valley Road, 9 miles north of Paris, in Bourbon County:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate fine and medium granular structure; very friable; many small roots; few fine pores; slightly acid; clear smooth boundary.

B1t—8 to 15 inches; brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; few fine pores; common clay films; few small black concretions; slightly acid; clear smooth boundary.

B21t—15 to 22 inches; strong brown (7.5YR 5/6) silty clay; moderate medium subangular blocky structure; firm; common fine roots; few small black concretions; many clay films; medium acid; clear smooth boundary.

B22t—22 to 28 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; firm; few small roots; many clay films; medium acid; clear smooth boundary.

B3t—28 to 49 inches; yellowish brown (10YR 5/4) clay; common medium distinct light brownish gray (2.5Y 6/2) and common medium faint yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak fine angular blocky structure; very firm; many black concretions; few fine roots; slightly acid.

R—49 inches; limestone bedrock.

The solum is 30 to 50 inches thick. The depth to bedrock ranges from 40 to 72 inches or more. Reaction to a depth of about 30 inches ranges from slightly acid to strongly acid, and from 30 inches to bedrock it ranges from strongly acid to mildly alkaline.

The Ap horizon is 7 to 12 inches thick. It has value of 4 or 5 and chroma of 2 or 3. It is silt loam or silty clay loam.

The B1 horizon is 0 to 7 inches thick. It has value of 4 or 5 and chroma of 4 or 6. It is silty clay loam or silty clay.

The B2t horizon is 12 to 30 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay loam or silty clay.

The B3t horizon is 8 to 30 inches thick. It has hue of 10YR to 5Y and chroma of 3 or 4. Mottles are in shades of brown, gray, yellow, and olive. This horizon is silty clay or clay.

Lowell Variant

The Lowell Variant consists of deep, moderately well and somewhat poorly drained, slowly permeable soils that formed in residuum of weathered limestone, siltstone, and calcareous shale. They are on broad ridgetops and side slopes and to a lesser extent along drainageways in Bourbon County, mainly west and southwest of Paris. Slope ranges from 2 to 12 percent.

Lowell Variant soils are on the same landscape with Elk, Dunning, Faywood, Lawrence, Lowell, Maury, McAfee, and Nicholson soils. Dunning soils are wetter and have a mollic epipedon. Elk, Lowell, and Maury soils lack the gray mottles in the upper 10 inches of the argillic horizon. Faywood and McAfee soils are less than 40 inches deep to bedrock. Lawrence and Nicholson soils have a fragipan.

Typical pedon of Lowell Variant silt loam in an area of Lowell Variant-Nicholson complex, 2 to 6 percent slopes, in a pasture field on a ridgetop, about seven-eighths of a mile east of intersection of Kentucky Highway 1677 and Hume-Bedford Road and one-fourth mile north of Hume-Bedford Road, about 6.1 miles west of Paris, in Bourbon County:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; few small black concretions; slightly acid; gradual smooth boundary.

B21t—11 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint strong brown (7.5YR 5/6) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; distinct clay films; medium acid; gradual smooth boundary.

B22t—18 to 23 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct light gray (10YR 7/2), pale brown (10YR 6/3), and strong brown (7.5YR

5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many clay films; few fine black concretions; strongly acid; gradual smooth boundary.

B23t—23 to 50 inches; light yellowish brown (10YR 6/4) clay; common medium distinct light brownish gray (10YR 6/2), pale brown (10YR 6/3), and strong brown (7.5YR 5/6) mottles; weak medium angular blocky structure; very firm; few fine roots; common clay films; many fine and medium black concretions; strongly acid; gradual smooth boundary.

Cr—50 to 60 inches; light yellowish brown (10YR 6/4) clay; many medium distinct gray (10YR 5/1) mottles; interbedded with soft siltstone, shale, and limestone; massive; slightly acid.

The solum is 36 to 60 inches thick. The depth to limestone or interbedded limestone, siltstone, and calcareous shale ranges from 40 to 72 inches. Limestone fragments make up 0 to 10 percent throughout the profile. Unless the soil is limed, reaction to a depth of 30 inches ranges from slightly acid to strongly acid; below that it ranges from strongly acid to medium acid and, in the horizon immediately above rock, medium acid to mildly alkaline.

The Ap horizon is 7 to 10 inches thick. It has value of 4 or 5 and chroma of 2 or 3.

The B1 horizon is 4 to 6 inches thick. It has chroma of 4 or 6. It is silt loam or silty clay loam.

The B2t horizon is 12 to 50 inches thick. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. It ranges from silty clay loam in the upper part to clay in the lower part. Mottles are in shades of gray and brown.

The C horizon, if present, is in shades of olive or brown. Mottles are in shades of gray or brown. The C horizon is a mixture of massive clay, soft limestone fragments, siltstone, and calcareous shale.

Maury series

The Maury series consists of deep, well drained, moderately to moderately rapidly permeable soils that formed in 1 to 2 feet of loamy material, probably loess, and the underlying residuum of weathered limestone. Maury soils are on broad ridgetops and side slopes in Bourbon County and in Nicholas County west of Carlisle. Slope ranges from 0 to 12 percent.

Maury soils are on the same landscape as Lowell Variant, Lowell, Faywood, McAfee, and Nicholson soils. Lowell Variant soils have gray mottles in the upper 10 inches of the argillic horizon. Lowell soils have a yellowish brown B2t horizon. Faywood and McAfee soils are less than 40 inches deep to bedrock. Nicholson soils have a fragipan.

Typical pedon of Maury silt loam, in an area of Maury silt loam, 2 to 6 percent slopes, in a pasture 50 feet northeast of large tobacco barn, one-fourth mile northwest of Townsend Valley Road and one-fourth mile southwest of intersection of U.S. 27, about 9 miles north of Paris, in Bourbon County:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; many fine pores; slightly acid; gradual smooth boundary.

B1—9 to 16 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; very friable; many fine roots; few fine pores; slightly acid; gradual smooth boundary.

B21t—16 to 24 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular block structure; friable; sticky and slightly plastic; few fine roots; few small pores; many clay films; medium acid; clear smooth boundary.

B22t—24 to 46 inches; yellowish red (5YR 4/6) silty clay; moderate medium angular blocky structure; friable; sticky and slightly plastic; common small black concretions; many clay films on ped faces; medium acid; gradual smooth boundary.

B23t—46 to 69 inches; dark brown (7.5YR 4/4) clay; weak medium angular blocky structure; very firm; sticky and plastic; many clay films; common black concretions; few very small chert fragments; medium acid.

R—69 inches; limestone bedrock.

The solum is 60 to 120 inches thick. The depth to bedrock ranges from 60 to 120 inches. Coarse fragments make up 0 to 5 percent of the solum. Reaction ranges from slightly acid to strongly acid, but ranges to neutral in the upper part if the soil is limed.

The Ap horizon is 8 to 10 inches thick. It has hue of 7.5YR or 10YR and chroma of 2 to 4. It is silt loam or silty clay loam.

The B1 horizon is 4 to 7 inches thick. It has hue of 7.5YR or 5YR. It is silt loam or silty clay loam.

The B2t horizon is more than 50 inches thick. The upper B2t horizons have chroma of 4 or 6. They are silty clay loam or silty clay. The lower B2t horizons have hue of 7.5YR, 5YR, and 2.5YR, value of 3 or 4, and chroma of 4 or 6. They are silty clay or clay.

The B3 of C horizon, if present, has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay or clay.

McAfee series

The McAfee series consists of moderately deep, well drained soils that have moderately slow permeability. These soils formed in residuum of weathered limestone. They are gently sloping to moderately steep, on ridgetops and side slopes in Bourbon County and in Nicholas County west of Carlisle. Slope ranges from 2 to 20 percent.

McAfee soils are on the same landscape as Lowell, Maury, Lowell Variant, Faywood, and Fairmount soils.

Lowell, Maury, and Lowell Variant soils are more than 40 inches deep to bedrock. Faywood soils are yellower in the B horizon and have lighter color in the surface layer. Fairmount soils are less than 20 inches deep to bedrock.

Typical pedon of McAfee silt loam, in an area of McAfee silt loam, 6 to 12 percent slopes, 660 feet southeast of large tobacco barn, one-fourth mile west of intersection of Townsend Valley Road and U.S. 27, about 9 miles north of Paris, in Bourbon County:

Ap—0 to 8 inches; dark reddish brown (5YR 3/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.
B1—8 to 13 inches; dark brown (7.5YR 4/4) silty clay loam; weak fine granular and some weak fine subangular blocky structure; firm; many fine roots; few clay films; neutral; clear smooth boundary.
B21t—13 to 21 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; very firm; many clay films; common fine roots; few black concretions; neutral; clear smooth boundary.
B22t—21 to 32 inches; reddish brown (5YR 4/4) silty clay; moderate fine and medium subangular blocky structure; very firm; few fine roots; many clay films; few chert fragments; few black concretions; neutral.
R—32 inches; limestone bedrock.

The solum is 20 to 40 inches thick. The depth to limestone bedrock ranges from 20 to 40 inches. Limestone or chert fragments make up 0 to 15 percent of the solum. Reaction ranges from medium acid to neutral.

The Ap horizon is 6 to 10 inches thick. It has hue of 5YR, 7.5YR or 10YR and chroma of 2 to 4. It is silt loam or silty clay loam.

The B1 horizon is 0 to 8 inches thick. It has chroma of 3 or 4.

The B2t horizon is 15 to 21 inches thick. It has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 to 6. It is silty clay loam, silty clay, or clay.

Some pedons have a B3t horizon or a C horizon, or both, that have colors like the B2t horizon. They are silty clay or clay. In some pedons, they are mottled in shades of yellow and brown.

Newark series

The Newark series consists of deep, somewhat poorly drained, moderately permeable soils that formed in alluvium washed from soils that derived from limestone, calcareous siltstone, and shale. Newark soils are nearly level and are on narrow flood plains along small streams. To a lesser extent, they are on wide flood plains. They are saturated in winter and early in spring.

Newark soils are on the same landscape as Nolin, Lindside, and Dunning soils. Nolin soils are well drained. Lindside soils are moderately well drained. Dunning soils are very poorly to poorly drained and are more clayey.

Typical pedon of Newark silt loam, in a bottom 660 feet northwest of Kentucky Highway 1956, one-half mile west of U.S. 227, 1 mile north of Bourbon-Clark County line, in Bourbon County:

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.
B21—5 to 11 inches; grayish brown (10YR 5/2) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak fine granular structure; very friable; many fine roots; few tubular pores; common iron stains; neutral; clear wavy boundary.
B22g—11 to 27 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium distinct light gray (10YR 7/2), pale brown (10YR 6/3), brown (7.5YR 4/4), and strong brown (7.5YR 5/8) mottles; weak medium angular blocky structure; friable; few fine roots; few black concretions; neutral; gradual wavy boundary.
C1g—27 to 40 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few fine faint pale brown (10YR 6/3) and few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/8) mottles; massive; friable; few fine roots; neutral.
C2—40 to 60 inches; brown (10YR 4/3) silty clay loam; many medium distinct gray (10YR 6/1) mottles; friable; few iron and manganese concretions; slightly acid.

The solum is 22 to 44 inches thick. The depth to bedrock is more than 60 inches. Reaction ranges from neutral to slightly acid.

The Ap horizon is 5 to 8 inches thick. It has hue of 10YR or 2.5Y, and chroma of 2 to 4.

The B21 horizon is 6 to 9 inches thick. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles are in shades of gray or brown.

The B22g horizon is 14 to 20 inches thick. It has value of 4 to 6 and chroma of 2 or less. It is silt loam or silty clay loam. Mottles are in shades of gray and brown.

The C1g horizon is 12 inches thick. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less. It is silty clay loam or loam. Mottles are in shades of gray or brown.

Colors of the C2 horizon are in shades of gray or brown and are mottled. It is silt loam or silty clay loam. Below a depth of 50 inches, a few pedons are silty clay.

Nicholson series

The Nicholson series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils formed in loamy material, probably loess, and underlying residuum of weathered limestone. They are gently sloping on broad ridgetops. Slopes are dominantly 2 to 6 percent.

Nicholson soils are on the same landscape as Lowell, Faywood, Eden, Lowell Variant, and Maury soils. Lowell,

Faywood, Eden, and Maury soils are clayey and well drained. Lowell Variant soils are clayey. All these soils lack a fragipan.

Typical pedon of Nicholson silt loam, in an area of Lowell Variant-Nicholson complex, 2 to 6 percent slopes, in a field about 1,200 feet south of the old Cincinnati-Frankfort Railroad, 1 mile southeast of Centerville and three-fourths of a mile southeast of intersection of U.S. 460 and Kentucky Highway 353, in Bourbon County:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

B21t—10 to 14 inches; brown (10YR 5/3) silty clay loam; weak fine subangular blocky structure; friable; few clay films; common fine roots and pores; few black concretions; slightly acid; clear smooth boundary.

B22t—14 to 24 inches; brown (10YR 5/3) silty clay loam; common fine faint pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few clay films; many fine roots and pores; common black concretions; slightly acid; abrupt wavy boundary.

Bx—24 to 44 inches; yellowish brown (10YR 5/6) silty clay loam; many medium prominent light gray (10YR 7/2), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to weak medium angular blocky; firm; compact and brittle; many medium and large black concretions and soft black materials; few fine roots between peds; strongly acid; gradual wavy boundary.

IIB3t—44 to 80 inches; mottled yellowish brown (10YR 5/6), light gray (10YR 7/2), and pale brown (10YR 6/3) clay; weak coarse subangular blocky structure; very firm; sticky and plastic; few slickensides; common black concretions; neutral.

The solum is from 40 to 80 inches thick. The depth to limestone bedrock ranges from 60 to 100 inches. Above the fragipan, reaction ranges from slightly acid to strongly acid; in the fragipan it ranges from strongly acid to medium acid, and below it from strongly acid to mildly alkaline.

The A horizon is 8 to 10 inches thick. It has value of 4 or 5 and chroma of 2 or 3.

The B2t horizon is 14 to 22 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam. Mottles are in shades of brown and, in some pedons, in shades of gray below the upper 10 inches of the argillic horizon.

The Bx horizon is 10 to 24 inches thick. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 or 6. It is silt loam or silty clay loam. Mottles are in chroma of 1 through 8.

The IIB horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay or clay. Mottles are in shades of gray or brown. Black concretions and black soft materials are common.

Some pedons have a IIC horizon that is similar in color and texture to the IIB horizon.

Nolin series

The Nolin series consists of deep, well drained, moderately permeable soils that formed in mixed alluvium. This nearly level soil is on flood plains and in depressions on uplands. It is subject to flooding of short duration. Slope ranges from 0 to 2 percent.

Nolin soils are on the same landscape as Newark, Lindside, Dunning, Boonesboro, Otwell, Allegheny, and Elk soils. Boonesboro soils are less than 40 inches deep to rock and have more coarse fragments. Nolin soils are better drained than Newark, Lindside, and Dunning soils. Otwell soils have a fragipan. Allegheny and Elk soils are on stream terraces and have an argillic horizon.

Typical pedon of Nolin silt loam, in a field adjacent to Townsend Creek, about one-fourth mile from U.S. 27 and Townsend Valley Road intersection, and about one-half mile south of Harrison-Bourbon County line, in Bourbon County:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable; few fine roots; common fine pores; neutral; gradual smooth boundary.

B21—9 to 20 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; very friable; few fine roots; common fine pores; slightly acid; gradual smooth boundary.

B22—20 to 49 inches; brown (10YR 5/3) silt loam; moderate fine subangular blocky structure; friable; thin organic coatings on peds; slightly acid; gradual smooth boundary.

C—49 to 72 inches; grayish brown (10YR 5/2) silty clay loam; massive; friable; few fine black concretions; thin organic coatings on peds; neutral.

The solum is 40 to 80 inches thick. The depth to limestone rock is more than 60 inches. Gravel makes up 0 to 5 percent of the solum. Reaction ranges from medium acid to mildly alkaline throughout the profile.

The Ap horizon is 6 to 10 inches thick. It has chroma of 2 or 3. It is silt loam, silty clay loam, or loam.

The B horizon is 35 to 64 inches thick. It has hue of 7/5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. Some pedons have pale brown mottles below 24 inches.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Gravel makes up 0 to 35 percent of the C horizon.

Otwell series

The Otwell series consists of deep, moderately well drained, very slowly permeable soils that have a fragipan. They formed in old alluvium washed from soils

that derived from loess and weathered limestone, shale, and siltstone. Otwell soils are on old high stream terraces and low terraces adjacent to flood plains. Slope ranges from 0 to 6 percent.

Otwell soils are on the same landscape as Elk, Lawrence, Lowell Variant, Allegheny, Nolin, Lindside, and Newark soils. Elk and Allegheny soils are well drained and lack a fragipan. Lawrence soils are somewhat poorly drained. Lowell Variant soils are clayey and lack a fragipan. Nolin, Lindside, and Newark soils are on floodplains and do not have an argillic horizon.

Typical pedon of Otwell silt loam, in an area of Otwell silt loam, 2 to 6 percent slopes, in a pasture 352 yards southeast of farmhouse, 539 yards northeast of Paris-Bethlehem Road and Antioch Road, about 9 miles southwest of Paris, in Bourbon County:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—12 to 18 inches; brown (10YR 5/3) silty clay loam; weak fine subangular blocky structure; friable; few fine brown concretions; few clay films; few ped coatings with organic stains; few fine roots; neutral; clear smooth boundary.

B22t—18 to 27 inches; brown (10YR 5/3) silty clay loam; few fine faint strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; few brown concretions; common clay films; few fine roots; slightly acid; clear wavy boundary.

Bx1—27 to 37 inches; pale brown (10YR 6/3) clay loam; few fine faint strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm and brittle; few patchy clay films on peds; few fine roots in cracks; strongly acid; clear wavy boundary.

Bx2—37 to 50 inches; pale brown (10YR 6/3) silty clay loam; few fine faint light gray (10YR 7/2) and strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to weak thin platy; very firm and brittle; few brown concretions; few patchy clay films on ped faces; few fine roots in cracks; strongly acid; clear smooth boundary.

IIC—50 to 74 inches; light brownish gray (10YR 6/2) silty clay; common fine faint strong brown (7.5YR 5/6) and yellowish brown (10YR 5/8) mottles; massive; common medium black concretions; neutral.

The solum is 40 to 80 inches thick. The depth to bedrock ranges from 60 inches to more than 100 inches. The depth to the fragipan ranges from 18 to 30 inches. Reaction above and in the fragipan ranges from strongly acid to very strongly acid, unless the soil is limed, and from neutral to very strongly acid in the horizons below the fragipan.

The Ap horizon is 7 to 12 inches thick. It has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 or 3.

The Bt horizon is 10 to 20 inches thick. It has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam.

The Bx horizon is 8 to 25 inches thick. It has hue of 10YR, value of 5 or 6, and chroma of 3 through 6. It is silt loam, silty clay loam, or clay loam. Mottles are in shades of brown, gray, and yellow.

The IIB3 (where present) and IIC horizons have hue of 2.5Y, 7.5YR or 10YR, value of 5 to 7, and chroma of 0 to 6. They are silty clay, silty clay loam, or silt loam or their gravelly analogs, and they are stratified. Mottles are in shades of brown and gray.

formation of the soils

This section discusses the factors of soil formation, relates them to soils in the survey area, and explains the processes of soil formation.

factors of soil formation

The characteristics of a soil at any given point depend on the physical and chemical composition of parent material and on climate, relief, plant and animal life, and time. Soils form by the interaction of these five factors. The relative importance of each factor differs from one soil to another. In some areas one factor may dominate the formation of soil characteristics, and in other areas another factor may dominate. In Bourbon and Nicholas Counties, climate and plant and animal life are not likely to vary greatly, but there are differences in relief and parent material.

Because the interrelationships between the five factors are so complex, the effect of any one factor is hard to determine. The following is a brief discussion of some of the ways in which these factors have influenced soil formation in Bourbon and Nicholas Counties.

parent material

Parent material is the soft, unconsolidated mass in which soils form. It influences the mineral and chemical composition of the soil and to a large extent the rate at which soil formation takes place. In Bourbon and Nicholas Counties the soils formed in parent material derived from the weathering or decomposition of rocks and minerals of the Ordovician period (*5*). The soils formed in residuum (parent material that weathered in place), alluvium (material that washed from soils and was deposited by water), and loess (material that was deposited by wind).

Eden soils formed on uplands in residuum of mainly calcareous shale that has thin layers of limestone and siltstone. Cynthiana, Faywood, Fairmount, Lowell, Lowell Variant, Maury, and McAfee soils formed mainly in material that weathered from limestone that has thin layers of calcareous shale. Maury soils formed mainly in residuum of phosphatic limestone. All these soils are clayey in the lower part of the B horizon and in the C horizon.

A few soils, for example, Maury and Nicholson soils, have a mantle of loess over limestone residuum. The upper part of the solum has a high content of silt, and the lower part is clayey.

Allegheny, Elk, Lawrence, and Otwell soils formed in old alluvium on low stream terraces and, to a lesser extent, on high stream terraces. Boonesboro, Dunning, Lindside, Newark, and Nolin soils formed in more recent alluvium on flood plains. All these soils except Dunning soils have less clay in the B and C horizons than soils that formed in residuum. Dunning soils apparently formed in old alluvium that was deposited in slack-water areas.

climate

The climate of Bourbon and Nicholas Counties is humid termperate. The average annual precipitation is 44 inches. The soils are never completely dry, and they are subject to leaching throughout most of the year. The average summer air temperature is 72 degrees F, and the average winter air temperature is 32 degrees F.

The soils in Bourbon and Nicholas Counties that best show the influence of climate have a leached, acid (if lime has not been added), dark grayish brown or yellowish brown Bt horizon that is finer textured than the surface layer. The well drained Lowell soils are an example. The depth of leaching is not great because base saturation of most soils within 50 inches of the surface is more than 35 percent.

Maury soils have a reddish brown, yellowish red, or red Bt horizon that is thicker than that of Lowell soils. They probably formed partly on an older land surface than Lowell soils and in a climate that was warmer than the present climate. For more detailed information on climate, see the section "General nature of the county."

relief

Relief, or the position, shape, and slope of the landscape, influences the formation of soils mainly through its effect on drainage and erosion. Relief also influences the formation of soils through variations in exposure to sun, wind, air, drainage, and plant cover.

Lowell, Lowell Variant, Nicholson, and Maury soils are gently sloping to sloping. Runoff is slow to medium, so enough water enters the soil to activate the soil-forming processes. These soils have a very friable A horizon that is low or moderate in content of organic matter. Leaching of bases has made the A horizon medium acid or strongly acid, if lime has not been added. The B horizon has more clay than the A horizon; it has clay accumulations to a depth of 40 to more than 60 inches.

Faywood and McAfee soils in most places are steeper than Lowell and Maury soils, and they are shallower to

bedrock. The shallowness is due in part to recent and geologic erosion.

Eden soils and some Cynthiana and Fairmount soils formed in a highly dissected area that has narrow ridges, V-shaped valleys, steep side slopes, and crooked drainage patterns. The elevation ranges from about 590 to 1,065 feet above sea level. Runoff is rapid. Because much of the rainfall is lost through runoff, not enough water enters the soils to cause the soil-forming processes to be very active. Soil material is removed by erosion almost as rapidly as it is formed. Many of these soils are severely eroded. They have a thin A horizon that is generally a mixture of the A horizon and B horizon. The A horizon is not highly leached, and reaction is near neutral. The B horizon is thin, and clay has not accumulated below a depth of 20 to 30 inches. The B horizon does not vary greatly in color from the A and C horizons. The A, B, and C horizons have coarse fragments of limestone.

Newark soils are somewhat poorly drained and have a seasonal high water table because they are in low areas on first bottoms where water tends to collect.

plant and animal life

Plants affect soil formation mostly by adding organic matter to the soil material. Earthworms, ants, and burrowing animals mix the soil, generally making the soils more open and porous, and thus affecting soil structure. Bacteria and fungi contribute mainly by helping to decompose organic matter and thus releasing plant nutrients. The organic matter imparts a dark color to the soil material and affects soil structure.

The vegetation that grows on the soil during the period of soil formation influences the type of soil that forms. In Bourbon County the native vegetation was mostly hardwood forest and extensive canebrakes. Soils that have a darker colored and thicker surface layer probably formed under canebrakes, or grass, or both. Most soils in Nicholas County formed under hardwood forest. Soils that formed under hardwood forest have less organic matter than those that formed under grass.

Dunning soils have a thicker, darker colored A horizon than an A horizon that commonly develops in soils that formed under hardwood forest. Dunning soils probably formed in an old shallow lake under dense marshy vegetation.

The environment changed in Bourbon and Nicholas Counties when man cleared the trees and canebrakes. Most of the soils have been limed, seeded to grasses and legumes, and plowed many times since the trees and canebrakes were cut. Much man-made erosion has resulted. The main change in the soils is a plow layer (Ap horizon) instead of a thin, dark-colored organic-mineral layer over a leached layer (A1 and A2 horizons).

Today, man still has some influence on the formation of soils. He can influence the future course of soil development by such practices as cultivation, irrigation, drainage, introduction of new vegetation, and clearing of new land and subsequent removal of part of the original soil.

time

The length of time that the parent material has been in place and exposed to the active forces of climate and plant and animal life strongly influences the nature of the soil.

In the formation of soils, generally a long time is required for change to take place in the parent material. But soils are 'aged' according to the degree of soil development. Soils that have weakly developed genetic soil horizons are immature, and soils that have strongly developed genetic horizons are mature, even though the parent materials in which they formed are the same age.

The soils in Bourbon and Nicholas Counties range from immature to mature. Boonesboro, Lindside, Nolin, and Newark soils on first bottoms that are subject to overflow are immature. They have weakly developed soil horizons below the plow layer. Cynthiana, Eden, and Fairmount soils are somewhat immature. They have a thin B horizon as a result of excessive erosion during formation. Lowell, Lowell Variant, Maury, and Nicholson soils are mature soils. They have well developed horizons.

Maury soils have characteristics that indicate that they are much older than Lowell soils. They have clay accumulations at a greater depth, and they are redder and more oxidized than Lowell soils.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as

protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1: Temperature and precipitation

[Recorded in the period 1952-75 at Cynthiana, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum (°F)	Average daily minimum (°F)	Average daily (°F)	2 years in 10 will have-- Maximum temperature higher than-- (°F)	2 years in 10 will have-- Minimum temperature lower than-- (°F)	Average number of growing degree days [1] (Units)	Average (In)	2 years in 10 will have-- Less than-- (In)	2 years in 10 will have-- More than-- (In)	Average number of days with 0.10 inch or more	Average snowfall (In)
January	41.3	20.4	30.9	69	-14	11	3.36	2.07	4.52	9	7.5
February	44.1	22.2	31.8	68	-6	51	3.22	1.61	4.52	7	3.2
March	54.0	30.8	42.5	81	10	58	4.94	2.62	6.84	10	3.9
April	66.5	40.7	53.6	85	20	166	4.43	2.68	5.98	9	.2
May	75.7	49.6	60.0	92	28	600	4.17	2.46	5.70	9	.0
June	83.6	58.2	70.9	96	40	627	3.99	2.66	5.20	7	.0
July	87.6	62.3	75.0	98	47	775	4.68	3.33	5.93	8	.0
August	86.8	60.8	70.7	98	44	864	3.64	2.43	4.74	6	.0
September	81.6	53.8	67.7	96	34	531	3.17	1.44	4.57	5	.0
October	70.1	41.1	55.6	88	19	210	2.16	.90	3.17	5	.0
November	55.8	31.8	41.9	80	10	181	3.00	1.82	4.04	7	1.3
December	45.1	24.5	33.2	70	-2	85	3.44	1.93	4.66	7	2.3
Yearly:											
Average	66.0	41.4	52.8								
Extreme				100	-15						
Total						4,159	44.20	39.55	49.40	89	18.4

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2: Freeze dates in spring and fall

[Recorded in the period 1951-75 at Cynthiana, Kentucky]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 15	May 4	May 13
2 years in 10 later than--	April 11	April 29	May 8
5 years in 10 later than--	April 3	April 19	April 28
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	October 8	September 26
2 years in 10 earlier than--	October 23	October 13	October 1
5 years in 10 earlier than--	October 31	October 21	October 10

TABLE 3: Growing season

[Recorded in the period 1952-75 at Cynthiana, Kentucky]

Probability	Daily minimum temperature		
	Higher than 24° F *(Days)*	Higher than 28° F *(Days)*	Higher than 32° F *(Days)*
9 years in 10	192	165	144
8 years in 10	198	172	151
5 years in 10	211	184	165
2 years in 10	224	197	178
1 year in 10	230	204	185

TABLE 4: Acreage and proportionate extent of the soils

Map symbol	Soil name	Bourbon County *(Acres)*	Nicholas County *(Acres)*	Total-- Area *(Acres)*	Total-- Extent *(Pct)*
AlB	Allegheny loam, 2 to 6 percent slopes	0	750	750	0.2
AlC	Allegheny loam, 6 to 12 percent slopes	0	740	740	0.2
AlD	Allegheny loam, 12 to 20 percent slopes	0	290	290	0.1
Bo	Boonesboro silt loam	0	230	230	0.1
CnD	Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes	6,930	4,580	11,510	3.6
CnE	Cynthiana-Faywood complex, very rocky, 20 to 35 percent slopes	2,060	1,970	4,030	1.2
Du	Dunning silty clay loam	2,280	0	2,280	0.7
EdD	Eden silty clay loam, 6 to 20 percent slopes	2,490	0	2,490	0.8
EfD3	Eden flaggy silty clay, 6 to 20 percent slopes, severely eroded	0	21,900	21,900	6.8
EfE3	Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded	2,340	54,610	56,950	17.7
EkA	Elk silt loam, 0 to 2 percent slopes	210	50	260	0.1
EkB	Elk silt loam, 2 to 6 percent slopes	3,050	740	3,790	1.2
EkC	Elk silt loam, 6 to 12 percent slopes	730	240	970	0.3
FrD	Fairmount-Rock outcrop complex, 12 to 30 percent slopes	1,460	100	1,560	0.5
FrF	Fairmount-Rock outcrop complex, 30 to 50 percent slopes	1,530	850	2,380	0.7
FwB	Faywood silt loam, 2 to 6 percent slopes	3,230	1,680	4,910	1.5
FwC	Faywood silt loam, 6 to 12 percent slopes	27,080	10,330	37,410	11.6
FyD	Faywood silty clay loam, 12 to 20 percent slopes	10,210	9,560	19,770	6.1
La	Lawrence silt loam	170	0	170	(1)
Ln	Lindside silt loam	2,450	340	2,790	0.9
LoB	Lowell silt loam, 2 to 6 percent slopes	37,660	4,960	42,620	13.2
LoC	Lowell silt loam, 6 to 12 percent slopes	20,650	6,370	27,020	8.4
LvC	Lowell Variant silt loam, 6 to 12 percent slopes	800	30	830	0.3
LwB	Lowell Variant-Nicholson complex, 2 to 6 percent slopes	2,820	50	2,870	0.9
MaA	Maury silt loam, 0 to 2 percent slopes	390	0	390	0.1
MaB	Maury silt loam, 2 to 6 percent slopes	28,660	820	29,480	9.1
MaC	Maury silt loam, 6 to 12 percent slopes	5,110	250	5,360	1.7
McB	McAfee silt loam, 2 to 6 percent slopes	1,750	200	1,950	0.6
McC	McAfee silt loam, 6 to 12 percent slopes	15,260	460	15,720	4.9
McD	McAfee silt loam, 12 to 20 percent slopes	2,570	40	2,610	0.8
Ne	Newark silt loam	380	20	400	0.1
NfB	Nicholson silt loam, 2 to 6 percent slopes	0	1,470	1,470	0.5
No	Nolin silt loam	9,500	6,680	16,180	5.0
OtB	Otwell silt loam, 2 to 6 percent slopes	180	220	400	0.1
Pt	Pits-Dumps complex	50	30	80	(1)
	Total	192,000	130,560	322,560	100.0

[1] Less than 0.1 percent.

TABLE 5: Yields per acre of crops and pasture

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Tobacco *(Lb)*	Corn *(Bu)*	Wheat *(Bu)*	Soybeans *(Bu)*	Alfalfa hay *(Ton)*	Grass-legume hay *(Ton)*	Pasture *(AUM [1])*
AlB: Allegheny	2,800	115	45	40	4.5	3.5	7.0
AlC: Allegheny	2,750	105	40	35		3.5	7.0
AlD: Allegheny	2,400	90	35	30		3.0	6.0
Bo: Boonesboro	2,800	100	40	40	3.5	3.0	6.0
CnD: Cynthiana-Faywood						2.5	5.0
CnE: Cynthiana-Faywood							3.0
Du: Dunning		120		45		4.0	8.0
EdD: Eden		70	20	20	4.0	3.0	6.0
EfD3: Eden						2.5	5.0
EfE3: Eden							
EkA: Elk	3,000	125	45	40	5.5	4.0	8.0
EkB: Elk	3,000	120	45	40	5.0	4.0	8.0
EkC: Elk	2,600	110	40	35	4.5	4.0	8.0
FrD: Fairmount-Rock outcrop							2.5
FrF: Fairmount-Rock outcrop							
FwB: Faywood	2,400	90	25	30	3.5	3.5	7.0
FwC: Faywood	2,300	80	20	25	3.0	3.0	6.0
FyD: Faywood	2,050				2.5	2.5	5.0
La: Lawrence	1,700	80		35		3.0	6.0
Ln: Lindside	2,400	125		45	4.0	4.0	8.0
LoB: Lowell	3,000	120	45	40	5.0	4.0	8.0
LoC: Lowell	2,800	110	40	35	5.0	4.0	8.0
LvC: Lowell Variant	2,200	90	35	30	3.5	3.5	7.0
LwB: Lowell Variant-Nicholson	2,500	110	40	35	4.0	3.5	7.0
MaA: Maury	3,200	135	50	45	5.5	4.5	9.0
MaB: Maury	3,200	125	50	40	5.5	4.5	9.0
MaC: Maury	3,000	115	45	35	5.0	4.5	9.0
McB: McAfee	2,600	100	30	35	4.0	3.5	7.0

TABLE 5: Yields per acre of crops and pasture—Continued

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Tobacco *(Lb)*	Corn *(Bu)*	Wheat *(Bu)*	Soybeans *(Bu)*	Alfalfa hay *(Ton)*	Grass-legume hay *(Ton)*	Pasture *(AUM [1])*
McC: McAfee	2,400	95	25	30	3.5	3.5	7.0
McD: McAfee	2,100	70	.....	.....	.....	3.0	6.0
Ne: Newark	2,500	110	.....	40	.....	4.0	8.0
NfB: Nicholson	3,000	130	40	40	4.0	3.5	7.0
No: Nolin	3,300	135	.....	45	4.5	4.5	9.0
OtB: Otwell	2,900	120	40	40	3.5	3.5	7.0
Pt: Pits-Dumps	.....	.....	.....	.....	.....	.....	.....

[1] Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6: Capability classes and subclasses

[Miscellaneous areas are excluded. Dashes indicate no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e) *(Acres)*	Wetness (w) *(Acres)*	Soil problem (s) *(Acres)*	Climate (c) *(Acres)*
I:					
Bourbon County	12,550	----	----	----	----
Nicholas County	7,070	----	----	----	----
II:					
Bourbon County	77,730	77,350	380	----	----
Nicholas County	11,140	10,890	20	230	----
III:					
Bourbon County	72,080	69,630	2,450	----	----
Nicholas County	18,420	18,420	----	----	----
IV:					
Bourbon County	15,270	15,270	----	----	----
Nicholas County	9,890	9,890	----	----	----
V:					
Bourbon County	----	----	----	----	----
Nicholas County	----	----	----	----	----
VI:					
Bourbon County	8,390	----	----	8,390	----
Nicholas County	26,580	21,900	----	4,680	----
VII:					
Bourbon County	5,930	2,340	----	3,590	----
Nicholas County	57,430	54,610	----	2,820	----
VIII:					
Bourbon County	----	----	----	----	----
Nicholas County	----	----	----	----	----

TABLE 7: Woodland management and productivity

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
AlB, AlC: Allegheny	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Eastern white pine Shortleaf pine	80 83 75 94 77	Eastern white pine, yellow-poplar, black walnut.
AlD: Allegheny	2r	Moderate	Moderate	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Eastern white pine Shortleaf pine	80 83 75 94 77	Eastern white pine, yellow-poplar, black walnut.
Bo: Boonesboro	1o	Slight	Slight	Slight	Severe	Northern red oak	85	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white ash, eastern white pine, shortleaf pine.
CnD:								
Cynthiana	4d	Moderate	Moderate	Severe	Slight	Eastern redcedar	42	Eastern redcedar, Virginia pine.
Faywood	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
CnE:								
Cynthiana	4d	Moderate	Moderate	Severe	Slight	Eastern redcedar	42	Eastern redcedar, Virginia pine.
Faywood	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
Du: Dunning	1w	Slight	Severe	Severe	Severe	Pin oak Sweetgum Eastern cottonwood.	95 95 100	Loblolly pine, pin oak.
EdD: Eden	3c	Moderate	Moderate	Moderate	Moderate	Eastern redcedar Scarlet oak	44 64	Eastern redcedar, Virginia pine, Scotch pine, Austrian pine.
EfD3: Eden	4c	Moderate	Moderate	Severe	Slight	Eastern redcedar	35	Eastern redcedar, Virginia pine, Scotch pine, Austrian pine.
EfE3: Eden	4c	Severe	Severe	Severe	Slight	Eastern redcedar	35	Eastern redcedar, Virginia pine, Scotch pine, Austrian pine.

TABLE 7: Woodland management and productivity—Continued

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
EkA, EkB, EkC: Elk	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine Eastern white pine	80 90 80 90	Eastern white pine, yellow-poplar, black walnut, loblolly pine.
FrD:								
Fairmount	4x	Moderate	Severe	Severe	Slight	Northern red oak Virginia pine Eastern redcedar	60 60 42	Eastern redcedar, Virginia pine.
Rock outcrop.								
FrF:								
Fairmount	4x	Severe	Severe	Severe	Slight	Northern red oak Virginia pine Eastern redcedar	60 60 42	Eastern redcedar, Virginia pine.
Rock outcrop.								
FwB, FwC: Faywood	3c	Slight	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar
FyD: Faywood	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
La: Lawrence	2w	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar Sweetgum Shortleaf pine	73 86 87 69	Yellow-poplar, white ash, loblolly pine, American sycamore.
Ln: Lindside	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar White oak	85 95 85	Eastern white pine, yellow-poplar, black walnut, white ash.
LoB, LoC: Lowell	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar White ash	81 90 75	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, loblolly pine.
LvC: Lowell Variant	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar	81 90	Yellow-poplar, eastern white pine, shortleaf pine.
LwB:								
Lowell Variant	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar	81 90	Yellow-poplar, eastern white pine, shortleaf pine.

TABLE 7: Woodland management and productivity—Continued

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
Nicholson	2o	Slight	Slight	Slight	Severe	Northern red oak	80	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
MaA, MaB, MaC: Maury	2o	Slight	Slight	Slight	Severe	Northern red oak	80	Black walnut, yellow-poplar, white ash, eastern white pine, shortleaf pine.
McB, McC: McAfee	3c	Slight	Moderate	Slight	Moderate	Northern red oak Eastern redcedar Yellow-poplar	79 50 85	Eastern redcedar, eastern white pine, yellow-poplar, black walnut, black locust, shortleaf pine.
McD: McAfee	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern redcedar Yellow-poplar	79 50 85	Eastern redcedar, eastern white pine, yellow-poplar, black walnut, black locust, shortleaf pine.
Ne: Newark	1w	Slight	Moderate	Moderate	Severe	Pin oak Eastern cottonwood Northern red oak Yellow-poplar Sweetgum	99 89 85 95 85	Eastern cottonwood, sweetgum, post oak, loblolly pine, red maple, American sycamore, eastern white pine, yellow-poplar.
NfB: Nicholson	2o	Slight	Slight	Slight	Severe	Northern red oak Sweetgum, Yellow-poplar	75 85 107	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
No: Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum Eastern cottonwood	99 72	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
OtB: Otwell	3o	Slight	Slight	Slight	Moderate	White oak	69	Eastern white pine, yellow-poplar, white ash.

TABLE 8: Recreational development

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AlB: Allegheny	Slight	Slight	Moderate: slope	Slight	Slight.
AlC: Allegheny	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope.
AlD: Allegheny	Severe: slope	Severe: slope	Severe: slope	Moderate: slope	Severe: slope.
Bo: Boonesboro	Severe: floods	Moderate: floods	Moderate: slope, floods.	Slight	Moderate: floods.
CnD:					
Cynthiana	Severe: large stones	Moderate: too clayey, large stones.	Severe: slope, depth to rock.	Moderate: too clayey, large stones.	Severe: depth to rock.
Faywood	Moderate: percs slowly, slope.	Moderate: slope, too clayey.	Severe: slope	Moderate: too clayey	Moderate: slope, depth to rock.
CnE:					
Cynthiana	Severe: slope, large stones.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.
Faywood	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Du: Dunning	Severe: floods, wetness.	Severe: wetness	Severe: floods, wetness.	Severe: wetness	Severe: floods, wetness.
EdD: Eden	Moderate: slope, percs slowly.	Moderate: slope, too clayey.	Severe: slope	Moderate: too clayey	Moderate: too clayey.
EfD3: Eden	Severe: too clayey	Severe: too clayey	Severe: slope, too clayey.	Severe: too clayey	Severe: slope.
EfE3: Eden	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey	Severe: too clayey.
EkA: Elk	Severe: floods	Slight	Slight	Slight	Slight.
EkB: Elk	Slight	Slight	Moderate: slope	Slight	Slight.
EkC: Elk	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope.
FrD, FrF:					
Fairmount	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, too clayey.	Severe: slope, depth to rock.
Rock outcrop.					
FwB: Faywood	Moderate: percs slowly.	Slight	Moderate: depth to rock, slope.	Slight	Moderate: depth to rock.
FwC: Faywood	Moderate: percs slowly, slope.	Moderate: slope	Severe: slope	Slight	Moderate: slope, depth to rock.
FyD: Faywood	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, too clayey.	Severe: slope.
La: Lawrence	Severe: floods, wetness.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness.
Ln: Lindside	Severe: floods	Moderate: floods	Severe: floods	Moderate: floods	Severe: floods.

TABLE 8: Recreational development—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LoB: Lowell	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight	Slilght.
LoC: Lowell	Moderate: percs slowly, slope.	Moderate: slope	Severe: slope	Slight	Moderate: slope.
LvC: Lowell Variant	Moderate: percs slowly, wetness, slope.	Moderate: slope, wetness.	Severe: slope	Slight	Moderate: slope.
LwB:					
Lowell Variant	Moderate: percs slowly, wetness.	Moderate: wetness	Moderate: percs slowly, wetness, slope.	Slight	Slight.
Nicholson	Moderate: percs slowly, wetness.	Moderate: wetness	Moderate: slope, percs slowly, wetness.	Slight	Slilght.
MaA: Maury	Slight	Slight	Slight	Slight	Slight.
MaB: Maury	Slight	Slight	Moderate: slope	Slight	Slight.
MaC: Maury	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope.
McB: McAfee	Moderate: percs slowly.	Slight	Moderate: depth to rock, slope, percs slowly.	Slight	Moderate: depth to rock.
McC: McAfee	Moderate: slope, percs slowly.	Moderate: slope	Severe: slope	Slight	Moderate: slope, depth to rock.
McD: McAfee	Severe: slope	Severe: slope	Severe: slope	Moderate: slope	Severe: slope.
Ne: Newark	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
NfB: Nicholson	Moderate: percs slowly, wetness.	Moderate: wetness	Moderate: slope, percs slowly, wetness.	Slight	Slight.
No: Nolin	Severe: floods	Moderate: floods	Severe: floods	Moderate: floods	Severe: floods.
OtB: Otwell	Severe: percs slowly, floods.	Moderate: wetness	Severe: percs slowly	Slight	Slight.
Pt:					
Pits.					
Dumps.					

TABLE 9: Wildlife habitat

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AlB: Allegheny	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
AlC: Allegheny	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
AlD: Allegheny	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Bo: Boonesboro	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
CnD:										
Cynthiana	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Faywood	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
CnE:										
Cynthiana	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Faywood	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Du: Dunning	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
EdD, EfD3: Eden	Fair	Good	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
EfE3: Eden	Very poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
EkA, EkB: Elk	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
EkC: Elk	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
FrD:										
Fairmount	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Rock outcrop.										
FrF:										
Fairmount	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Rock outcrop.										
FwB: Faywood	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
FwC: Faywood	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
FyD: Faywood	Poor	Poor	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
La: Lawrence	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ln: Lindside	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
LoB: Lowell	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
LoC: Lowell	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.

TABLE 9: Wildlife habitat—Continued

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
LvC: Lowell Variant	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
LwB:										
Lowell Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
Nicholson	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
MaA, MaB: Maury	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
MaC: Maury	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
McB: McAfee	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
McC: McAfee	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
McD: McAfee	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Ne: Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
NfB: Nicholson	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
No: Nolin	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
OtB: Otwell	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Pt:										
Pits.										
Dumps.										

TABLE 10: Building site development

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AlB: Allegheny	Slight	Slight	Slight	Moderate: slope	Moderate: low strength.	Slight.
AlC: Allegheny	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope, low strength.	Moderate: slope.
AlD: Allegheny	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Bo: Boonesboro	Severe: floods, depth to rock.	Severe: floods	Severe: floods, depth to rock.	Severe: floods	Severe: floods	Moderate: floods.
CnD:						
Cynthiana	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Faywood	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope	Moderate: slope, depth to rock, low strength.	Moderate: slope, depth to rock.
CnE:						
Cynthiana	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Faywood	Severe: slope, depth to rock, too clayey.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope	Severe: slope.
Du: Dunning	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
EdD: Eden	Severe: too clayey	Moderate: slope, shrink-swell.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope	Severe: low strength.	Moderate: too clayey
EfD3: Eden	Severe: too clayey	Moderate: slope, shrink-swell.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope	Severe: low strengh.	Severe: too clayey.
EfE3: Eden	Severe: slope, too clayey.	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength.	Severe: slope.
EkA: Elk	Moderate: floods	Severe: floods	Severe: floods	Severe: floods	Moderate: floods, low strength.	Slight.
EkB: Elk	Slight	Slight	Slight	Moderate: slope	Moderate: low strength.	Slight.
EkC: Elk	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope, low strength.	Moderate: slope.
FrD, FrF:						
Fairmount	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.

TABLE 10: Building site development—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Rock outcrop.						
FwB: Faywood	Severe: depth to rock, too clayey.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: depth to rock, low strength.	Moderate: depth to rock.
FwC: Faywood	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope	Moderate: slope, depth to rock, low strength.	Moderate: slope, depth to rock.
FyD: Faywood	Severe: slope, depth to rock, too clayey.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope	Severe: slope.
La: Lawrence	Severe: wetness	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Ln: Lindside	Severe: floods, wetness.	Severe: floods	Severe: floods, wetness.	Severe: floods	Severe: floods.	
LoB: Lowell	Severe: too clayey	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
LoC: Lowell	Severe: too clayey	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope	Severe: low strength.	Moderate: slope.
LvC: Lowell Variant	Severe: too clayey	Moderate: shrink-swell, slope.	Severe: wetness	Severe: slope	Severe: low strength.	Moderate: slope.
LwB:						
Lowell Variant	Severe: too clayey	Moderate: shrink-swell.	Severe: wetness	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Nicholson	Severe: wetness, too clayey.	Moderate: wetness	Severe: wetness	Moderate: slope, wetness.	Severe: low strength.	Slight.
MaA: Maury	Moderate: too clayey.	Slight	Slight	Slight	Moderate: low strength.	Slight.
MaB: Maury	Moderate: too clayey.	Slight	Slight	Moderate: slope	Moderate: low strength.	Slight.
MaC: Maury	Moderate; slope, too clayey.	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope, low strength.	Moderate: slope.
McB: McAfee	Severe: depth to rock, too clayey.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: depth to rock.
McC: McAfee	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope	Moderate: slope, depth to rock, low strength.	Moderate: slope, depth to rock.
McD: McAfee	Severe: depth to rock, slope, too clayey.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope	Severe: slope.

TABLE 10: Building site development—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ne: Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, low strength.	Severe: floods.
NfB: Nicholson	Severe: wetness, too clayey.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
No: Nolin	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods, low strength.	Severe: floods.
OtB: Otwell	Severe: wetness	Severe: floods	Severe: wetness, floods.	Severe: floods	Severe: low strength.	Slight.
Pt: Pits. Dumps.						

TABLE 11: Sanitary facilities

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AlB: Allegheny	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
AlC: Allegheny	Moderate: slope	Severe: slope	Slight	Moderate; slope	Fair: slope.
AlD: Allegheny	Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Poor: slope.
Bo: Boonesboro	Severe: floods, depth to rock.	Severe: floods, depth to rock, seepage.	Severe: floods, depth to rock, seepage.	Severe: floods, seepage.	Poor: thin layer.
CnD:					
Cynthiana	Severe: depth to rock	Severe: slope, depth to rock.	Severe: depth to rock	Moderate: slope	Poor: thin layer, too clayey.
Faywood	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope	Poor: thin layer.
CnE:					
Cynthiana	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope	Poor: slope, thin layer, too clayey.
Faywood	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope	Poor: slope, thin layer.
Du: Dunning	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: wetness, thin layer.
EdD, EfD3: Eden	Severe: percs slowly, depth to rock.	Severe: slope	Severe: too clayey, depth to rock.	Moderate: slope	Poor: too clayey, thin layer.
EfE3: Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope	Severe: slope, too clayey, depth to rock.	Severe: slope	Poor: slope, too clayey, thin layer.
EkA: Elk	Moderate: floods	Severe: floods	Moderate: floods	Moderate: floods	Good.
EkB: Elk	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
EkC: Elk	Moderate: slope	Severe: slope	Slight	Moderate: slope	Fair: slope.
FrD:					
Fairmount	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock	Severe: slope	Poor: slope, too clayey, area reclaim.
Rock outcrop.					
FrF:					
Fairmount	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope	Poor: slope, too clayey, area reclaim.
Rock outcrop.					
FwB: Faywood	Severe: depth to rock, percs slowly.	Severe: depth to rock	Severe: depth to rock, too clayey.	Slight	Poor: too clayey, area reclaim.
FwC: Faywood	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope	Poor: too clayey, area reclaim.

TABLE 11: Sanitary facilities—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil *was not* rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FyD: Faywood	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey, area reclaim.
La: Lawrence	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: wetness	Severe: wetness	Good.
Ln: Lindside	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
LoB: Lowell	Severe: percs slowly	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.
LoC: Lowell	Severe: percs slowly	Severe: slope	Severe: depth to rock, too clayey.	Moderate: slope	Poor: too clayey.
LvC: Lowell Variant	Severe: percs slowly, wetness.	Severe: wetness, slope.	Severe: depth to rock, wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey.
LwB:					
Lowell Variant	Severe: percs slowly, wetness.	Severe: wetness	Severe: depth to rock, wetness, too clayey.	Moderate: wetness	Poor: too clayey.
Nicholson	Severe: percs slowly, wetness.	Severe: wetness	Severe: wetness, too clayey.	Moderate: wetness	Fair: too clayey.
MaA: Maury	Slight	Moderate: seepage	Moderate: too clayey	Slight	Fair: too clayey.
MaB: Maury	Slight	Moderate: slope, seepage.	Moderate: too clayey	Slight	Fair: too clayey.
MaC: Maury	Moderate: slope	Severe: slope	Moderate: too clayey	Moderate: slope	Fair: slope, too clayey.
McB: McAfee	Severe: depth to rock, percs slowly.	Severe: depth to rock	Severe: depth to rock, too clayey.	Slight	Poor: too clayey, area reclaim.
McC: McAfee	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope	Poor: too clayey, area reclaim.
McD: McAfee	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey, area reclaim.
Ne: Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
NfB: Nicholson	Severe: percs slowly, wetness.	Severe: wetness	Severe: wetness, too clayey.	Moderate: wetness	Fair: too clayey.
No: Nolin	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Good.
OtB: Otwell	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness	Moderate: wetness	Fair: too clayey.

TABLE 11: Sanitary facilities—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pt: Pits.					
Dumps.					

TABLE 12: Construction materials

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AlB: Allegheny	Fair; low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
AlC: Allegheny	Fair: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope, thin layer.
AlD: Allegheny	Fair: slope, low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
Bo: Boonesboro	Poor: thin layer	Unsuited: excess fines	Poor: excess fines	Fair: area reclaim.
CnD:				
Cynthiana	Poor: low strength, thin layer.	Unsuited: excess fines	Unsuited: excess fines	Poor: thin layer, too clayey.
Faywood	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: thin layer.
CnE:				
Cynthiana	Poor: slope, low strength, thin layer.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, thin layer, too clayey.
Faywood	Poor: slope, low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, thin layer.
Du: Dunning	Poor: wetness, low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: wetness.
EdD, EfD3: Eden	Poor: thin layer, low strength.	Unsuited: excess fines	Unsuited: excess fines	Poor: large stones, too clayey.
EfE3: Eden	Poor: slope, thin layer, low strength.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, too clayey, large stones.
EkA, EkB: Elk	Fair: low strength	Unsuited: excess fines	Unsuited: excess fines	Good.
EkC: Elk	Fair: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
FrD:				
Fairmount	Poor: low strength, thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, too clayey.
Rock outcrop.				
FrF:				
Fairmount	Poor: slope, low strength, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, too clayey.
Rock outcrop.				
FwB, FwC: Faywood	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: thin layer.
FyD: Faywood	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, thin layer.
La: Lawrence	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
Ln: Lindside	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Good.
LoB: Lowell	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
LoC: Lowell	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope, thin layer.
LvC: Lowell Variant	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.

TABLE 12: Construction materials—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LwB:				
Lowell Variant	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Good.
Nicholson	Poor: low strength, wetness	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
MaA, MaB: Maury	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Good.
MaC: Maury	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
McB, McC: McAfee	Poor: low strength, thin layer.	Unsuited: excess fines	Unsuited: excess fines	Poor: thin layer.
McD: McAfee	Poor: low strength, thin layer.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, thin layer.
Ne: Newark	Poor: wetness	Unsuited: excess fines	Unsuited: excess fines	Good.
NfB: Nicholson	Poor: low strength, wetness	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
No: Nolin	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Good.
OtB: Otwell	Poor: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: thin layer.
Pt:				
Pits.				
Dumps.				

TABLE 13: Water management

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AlB, AlC, AlD: Allegheny.	Seepage	Piping	Not needed	Slope	Slope.
Bo: Boonesboro	Seepage, depth to rock.	Seepage, thin layer	Not needed	Not needed	Erodes easily, depth to rock.
CnD, CnE: Cynthiana	Depth to rock, slope	Thin layer, hard to pack.	Not needed	Depth to rock, slope	Slope, rooting depth.
Faywood	Depth to rock, slope	Thin layer, hard to pack.	Not needed	Depth to rock, slope	Slope, erodes easily, rooting depth.
Du: Dunning	Favorable	Hard to pack, wetness	Floods, percs slowly	Not needed	Wetness, erodes easily, percs slowly.
EdD, EfD3, EfE3: Eden.	Depth to rock	Hard to pack, thin layer.	Not needed	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
EkA, EkB, EkC: Elk	Seepage	Piping	Not needed	Slope	Slope.
FrD, FrF: Fairmount	Depth to rock	Thin layer, hard to pack.	Not needed	Depth to rock, slope	Slope, rooting depth, erodes easily.
Rock outcrop.					
FwB, FwC, FyD: Faywood.	Depth to rock, slope	Thin layer, hard to pack.	Not needed	Depth to rock, slope	Slope, erodes easily, rooting depth.
La: Lawrence	Favorable	Piping, wetness	Percs slowly, wetness	Not needed	Percs slowly, wetness, rooting depth.
Ln: Lindside	Seepage	Erodes easily, piping	Floods	Not needed	Wetness.
LoB: Lowell	Seepage, depth to rock.	Hard to pack	Not needed	Favorable	Erodes easily.
LoC: Lowell	Slope	Hard to pack	Not needed	Favorable	Slope, erodes easily.
LvC: Lowell Variant	Depth to rock	Hard to pack	Slope, percs slowly	Wetness	Slope, erodes easily.
LwB: Lowell Variant	Depth to rock	Hard to pack	Percs slowly	Wetness	Erodes easily.
Nicholson	Favorable	Hard to pack	Percs slowly, slope	Rooting depth, wetness, erodes easily.	Rooting depth, erodes easily.
MaA, MaB, MaC: Maury.	Seepage	Hard to pack	Not needed	Slope	Slope.
McB, McC, McD: McAfee.	Depth to rock	Thin layer, hard to pack.	Not needed	Depth to rock, slope	Slope, erodes easily, rooting depth.
Ne: Newark	Seepage	Wetness	Floods	Not needed	Wetness, erodes easily.

TABLE 13: Water management—Continued

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
NfB: Nicholson	Favorable	Hard to pack	Percs slowly, slope	Rooting depth, wetness, erodes easily.	Rooting depth, erodes easily.
No: Nolin	Seepage	Piping	Not needed	Not needed	Erodes easily.
OtB: Otwell	Favorable	Favorable	Not needed	Erodes easily, rooting depth.	Erodes easily, rooting depth.
Pt:					
Pits.					
Dumps.					

TABLE 14: Engineering properties and classifications

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth *(In)*	USDA texture	Classification		Frag-ments > 3 inches *(Pct)*	Percentage passing sieve number--				Liquid limit *(Pct)*	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
AlB, AlC, AlD: Allegheny.	0-11	Loam	ML, CL, CL-ML.	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	11-69	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC.	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	69-79	Clay loam, sandy loam, gravelly sandy loam.	SM, GC, ML, CL.	A-4, A-6, A-2, A-1.	0-5	65-100	55-100	35-95	20-75	<35	NP-15
Bo: Boonesboro	0-12	Silt loam	ML, CL, CL-ML.	A-4, A-6	0-5	90-100	85-100	80-100	70-95	25-35	NP-11
	12-32	Gravelly silt loam, flaggy loam, very gravelly silty clay loam.	GM-GC, GC, CL, CL-ML.	A-2, A-4, A-6, A-7.	0-20	50-75	40-70	35-65	25-60	25-42	5-20
	32	Unweathered bedrock.									
CnD: Cynthiana	0-6	Silty clay loam	ML, CL, CL-ML.	A-4, A-6, A-7	0-30	70-100	65-100	60-100	55-100	25-42	4-20
	6-16	Flaggy clay, flaggy silty clay, clay.	MH, CH, CL	A-7	5-30	70-100	65-100	60-100	55-100	45-75	20-45
	16	Unweathered bedrock.									
Faywood	0-7	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	7-29	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	29	Unweathered bedrock.									
CnE: Cynthiana	0-6	Silty clay loam	ML, CL, CL-ML.	A-4, A-6, A-7	0-30	70-100	65-100	60-100	55-100	25-42	4-20
	6-16	Flaggy clay, flaggy silty clay, clay.	MH, CH, CL	A-7	5-30	70-100	65-100	60-100	55-100	45-75	20-45
	16	Unweathered bedrock.									
Faywood	0-7	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	7-29	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	29	Unweathered bedrock.									
Du: Dunning	0-20	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-95	34-42	15-22
	20-72	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
EdD: Eden	0-5	Silty clay loam	ML, CL, MH, CH.	A-7, A-6	0-20	85-100	80-100	75-100	70-100	35-65	12-35
	5-28	Flaggy silty clay, flaggy clay, silty clay.	MH, CH, CL	A-7	10-30	75-100	70-100	65-100	60-100	45-75	20-45
	28	Weathered bedrock									

TABLE 14: Engineering properties and classifications—Continued

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth *(In)*	USDA texture	Classification		Fragments > 3 inches *(Pct)*	Percentage passing sieve number--				Liquid limit *(Pct)*	Plasticity index
			Unified	AASHTO		4	10	40	200		
EfD3, EfE3: Eden	0-5	Flaggy silty clay	ML, CL, MH, CH.	A-7, A-6	10-30	65-75	60-70	60-70	55-65	35-65	12-35
	5-28	Flagy silty clay, flaggy clay, silty clay.	MH, CH, CL	A-7	10-30	75-100	70-100	65-100	60-100	45-75	20-45
	28	Weathered bedrock									
EkA, EkB, EkC: Elk	0-8	Silt loam	ML, CL, CL-ML.	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	8-54	Silty clay loam, silt loam.	ML, CL, CL-ML,.	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
	54-93	Silty clay loam, silt loam.	ML, CL, CL-ML, SM-SC.	A-4, A-6	0	75-100	50-100	45-100	40-95	25-40	5-15
FrD, FrF: Fairmount	0-8	Flaggy silty clay loam.	CL	A-6, A-7	8-50	80-100	70-100	65-100	60-95	35-45	15-22
	8-18	Flaggy silty clay loam, flaggy clay, flaggy silty clay.	CH, CL	A-7, A-6	8-50	80-100	70-100	65-100	60-100	40-70	20-40
	18	Unweathered bedrock.									
Rock outcrop											
FwB, FwC: Faywood	0-6	Silt loam	ML, CL, CL-ML.	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	6-34	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	34	Unweathered bedrock.									
FyD: Faywood	0-7	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	7-29	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	29	Unweathered bedrock.									
La: Lawrence	0-8	Silt loam	ML, CL, CL-ML.	A-4	0	100	95-100	90-100	80-100	25-35	2-10
	8-29	Silty clay loam, silt loam.	ML, CL, CL-ML.	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	29-48	Silty clay loam, silt loam.	ML, CL, CL-ML.	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	48-66	Silty clay, silty clay loam, silt loam.	ML, CL, MH, CL-ML.	A-4, A-6, A-7	0	95-100	90-100	85-100	75-100	25-60	5-25
Ln: Lindside	0-28	Silt loam	ML, CL, CL-ML.	A-4, A-6	0	100	95-100	80-100	55-90	25-40	2-15
	28-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6	0	100	95-100	80-100	55-95	25-40	2-20

TABLE 14: Engineering properties and classifications—Continued

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth *(In)*	USDA texture	Classification		Fragments > 3 inches *(Pct)*	Percentage passing sieve number--				Liquid limit *(Pct)*	Plasticity index
			Unified	AASHTO		4	10	40	200		
LoB, LoC: Lowell	0-15	Silt loam	ML, CL, CL-ML.	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	15-28	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	15-32
	28-49	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	49	Unweathered bedrock.									
LvC: Lowell Variant	0-7	Silt loam	ML, CL, CL-ML.	A-4	0-10	90-100	90-100	85-100	80-100	25-35	4-10
	7-18	Silt loam, silty clay loam.	CL	A-6	0-10	90-100	90-100	85-100	80-100	30-40	15-22
	18-50	Silty clay, clay	CH, MH, CL	A-7, A-6	0-10	90-100	90-100	85-100	80-100	40-70	20-45
	50-60	Weathered bedrock									
LwB:											
Lowell Variant	0-7	Silt loam	ML, CL, CL-ML.	A-4	0-10	90-100	90-100	85-100	80-100	25-35	4-10
	7-18	Silt loam, silty clay loam.	CL	A-6	0-10	90-100	90-100	85-100	80-100	30-40	15-22
	18-50	Silty clay, clay	CH, MH, CL	A-7, A-6	0-10	90-100	90-100	85-100	80-100	40-70	20-45
	50-60	Weathered bedrock									
Nicholson	0-10	Silt loam	ML, CL, CL-ML.	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	10-24	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	24-44	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	44-80	Silty clay, clay, channery clay.	CH, CL	A-7, A-6	0-10	80-100	70-100	60-100	55-95	40-70	16-40
MaA, MaB, MaC: Maury.	0-16	Silt loam	CL, CL-ML, ML.	A-4	0	100	95-100	90-100	80-100	25-35	4-10
	16-24	Silty clay loam	ML, CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-45	8-25
	24-46	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-6	0	95-100	90-100	85-100	80-100	35-60	15-35
	46-69	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0	95-100	90-100	85-100	75-100	35-70	20-40
McB, McC, McD: McAfee.	0-8	Silt loam	ML, CL-ML	A-4	0-10	90-100	85-100	75-100	70-100	25-35	4-10
	8-21	Silty clay, silty clay loam, clay.	CL, CH, MH	A-7, A-6	0-10	90-100	85-100	80-100	75-100	35-65	15-35
	21-32	Clay, silty clay	CH, MH, CL	A-7	0-15	80-100	75-100	70-100	65-95	45-75	20-45
	32	Unweathered bedrock.									
Ne: Newark	0-5	Silt loam	ML, CL, CL-ML.	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	5-40	Silt loam, silty clay loam.	ML, CL, CL-ML.	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	4-20
	40-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	4-20

TABLE 14: Engineering properties and classifications—Continued

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth *(In)*	USDA texture	Classification		Frag-ments > 3 inches *(Pct)*	Percentage passing sieve number--				Liquid limit *(Pct)*	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
NfB: Nicholson	0-10	Silt loam	ML, CL, CL-ML.	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	10-24	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	24-44	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	44-80	Silty clay, clay, channery clay.	CH, CL	A-7	0-10	80-100	70-100	60-100	55-95	40-70	16-40
No: Nolin	0-9	Silt loam	ML, CL, CL-ML.	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	9-72	Silt loam, silty clay loam.	ML, CL, CL-ML.	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
OtB: Otwell	0-12	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	12-27	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	27-50	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	20-30
	50-74	Stratified silt loam to silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	80-95	35-50	15-25
Pt: Pits.											
Dumps.											

TABLE 15: Physical and chemical properties of the soils

[The symbol < means less than. Entries under "Erosion factors—T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth *(in)*	Perme-ability *(In/hr)*	Available water capacity *(In/in)*	Soil reaction *(pH)*	Shrink-swell potential	Erosion factors	
						K	T
AlB, AlC, AlD: Allegheny	0-11	0.6-2.0	0.12-0.22	3.6-5.5	Low	0.32	4
	11-69	0.6-2.0	0.13-0.18	3.6-5.5	Low	0.28	
	69-79	0.6-2.0	0.08-0.17	3.6-5.5	Low	0.28	
Bo: Boonesboro	0-12	0.6-2.0	0.18-0.23	6.1-7.8	Low	0.37	3
	12-32	2.0-6.0	0.06-0.12	6.1-7.8	Low	0.17	
	32						
CnD:							
Cynthiana	0-6	0.6-2.0	0.15-0.20	6.1-7.8	Moderate	0.37	2
	6-16	0.2-0.6	0.08-0.15	6.1-7.8	Moderate	0.28	
	16						
Faywood	0-7	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	3
	7-29	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	0.28	
	29						
CnE:							
Cynthiana	0-6	0.6-2.0	0.15-0.20	6.1-7.8	Moderate	0.37	2
	5-16	0.2-0.6	0.08-0.15	6.1-7.8	Moderate	0.28	
	16						
Faywood	0-7	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	3
	7-29	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	0.28	
	29						
Du: Dunning	0-20	0.6-2.0	0.19-0.23	6.1-7.8	Moderate	0.28	5
	20-72	0.06-0.2	0.14-0.18	6.1-7.8	Moderate	0.28	
EdD: Eden	0-5	0.06-0.6	0.12-0.18	5.6-8.4	Moderate	0.43	3
	5-28	0.06-0.2	0.10-0.15	5.6-8.4	Moderate	0.28	
	28					0.17	
EfD3, EfE3: Eden	0-5	0.06-0.6	0.12-0.18	5.6-8.4	Moderate	0.43	3
	5-28	0.06-0.2	0.10-0.15	5.6-8.4	Moderate	0.28	
	28					0.17	
EkA, EkB, EkC: Elk	0-8	0.6-2.0	0.19-0.23	5.1-6.0	Low	0.32	4
	8-54	0.6-2.0	0.18-0.22	5.1-6.0	Low	0.28	
	54-93	0.6-2.0	0.14-0.20	5.1-6.5	Low	0.28	
FrD, FrF:							
Fairmount	0-8	0.06-0.6	0.12-0.20	6.6-8.4	Moderate	0.37	2
	8-18	0.06-0.6	0.10-0.18	6.6-8.4	Moderate	0.37	
	18						
Rock outcrop.							
FwB, FwC: Faywood	0-6	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	3
	6-34	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	0.28	
	34						
FyD: Faywood	0-7	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	3
	7-29	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	0.28	
	29						

TABLE 15: Physical and chemical properties of the soils—Continued

[The symbol < means less than. Entries under "Erosion factors—T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth *(In)*	Perme-ability *(In/hr)*	Available water capacity *(In/in)*	Soil reaction *(pH)*	Shrink-swell potential	Erosion factors	
						K	T
La: Lawrence	0-8	0.6-2.0	0.19-0.23	4.5-7.3	Low	0.43	3
	8-29	0.6-2.0	0.18-0.22	4.5-6.5	Low	0.37	
	29-48	0.06-0.2	0.08-0.12	4.5-5.5	Low	0.43	
	48-66	0.06-0.6	0.08-0.12	4.5-5.5	Low	0.37	
Ln: Lindside	0-28	0.6-2.0	0.20-0.26	5.6-7.8	Low	0.28	5
	28-60	0.6-2.0	0.17-0.22	5.6-7.8	Low	0.28	
LoB, LoC: Lowell	0-15	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.37	3
	15-28	0.2-2.0	0.13-0.19	5.1-6.5	Moderate	0.28	
	28-49	0.2-0.6	0.12-0.17	5.1-7.8	Moderate	0.28	
	49						
LvC: Lowell Variant	0-7	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.37	3
	7-18	0.2-2.0	0.18-0.23	5.1-6.5	Low	0.37	
	18-50	0.06-0.6	0.12-0.17	5.1-6.0	Moderate	0.28	
	50-60						
LwB:							
Lowell Variant	0-7	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.37	3
	7-18	0.2-2.0	0.18-0.23	5.1-6.5	Low	0.37	
	18-50	0.06-0.6	0.12-0.17	5.1-6.0	Moderate	0.28	
	50-60						
Nicholson	0-10	0.6-2.0	0.19-0.23	5.1-6.5	Low	0.43	3
	10-24	0.6-2.0	0.18-0.22	5.1-6.5	Low	0.43	
	24-44	0.06-0.2	0.07-0.12	5.1-6.5	Low	0.43	
	44-80	0.06-0.6	0.07-0.12	5.1-7.8	Moderate	0.37	
MaA, MaB, MaC: Maury	0-16	2.0-6.0	0.18-0.23	5.1-6.5	Low	0.32	4
	16-24	0.6-6.0	0.18-0.22	5.1-6.5	Low	0.28	
	24-46	0.6-6.0	0.15-0.20	5.1-6.5	Low	0.28	
	46-69	0.6-2.0	0.13-0.18	5.1-6.0	Low	0.28	
McB, McC, McD: McAfee	0-8	0.6-2.0	0.18-0.23	5.6-7.3	Low	0.37	3
	8-21	0.2-0.6	0.13-0.18	5.6-7.3	Moderate	0.28	
	21-32	0.2-0.6	0.10-0.16	6.1-7.3	Moderate	0.28	
	32						
Ne: Newark	0-5	0.6-2.0	0.15-0.23	6.1-7.3	Low	0.43	5
	5-40	0.6-2.0	0.18-0.23	6.1-7.3	Low	0.43	
	40-60	0.6-2.0	0.15-0.22	6.1-7.3	Low	0.43	
NfB: Nicholson	0-10	0.6-2.0	0.19-0.23	5.1-6.5	Low	0.43	3
	10-24	0.6-2.0	0.18-0.22	5.1-6.5	Low	0.43	
	24-44	0.06-0.2	0.07-0.12	5.1-6.0	Low	0.43	
	44-80	0.06-0.6	0.07-0.12	5.1-7.8	Moderate	0.37	
No: Nolin	0-9	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	5
	9-72	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	

TABLE 15: Physical and chemical properties of the soils—Continued

[The symbol < means less than. Entries under "Erosion factors—T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth *(In)*	Perme-ability *(In/hr)*	Available water capacity *(In/in)*	Soil reaction *(pH)*	Shrink-swell potential	Erosion factors	
						K	T
OtB: Otwell	0-12	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3
	12-27	0.06-0.2	0.18-0.22	4.5-5.5	Low	0.43	
	27-50	<0.06	0.06-0.08	4.5-5.5	Moderate	0.43	
	50-74	0.06-0.2	0.19-0.21	4.5-7.3	Moderate	0.43	
Pt:							
Pits.							
Dumps.							

TABLE 16: Soil and water features

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth (Ft)	Kind	Months	Depth (In)	Hardness	Uncoated steel	Concrete
AlB, AlC, AlD: Allegheny.	B	None			>6.0			>60		Low	High.
Bo: Boonesboro	B	Frequent	Brief	Dec-May	>6.0			20-40	Hard	Low	Low.
CnD, CnE: Cynthiana	D	None			>60			10-20	Hard	Moderate	Low.
Faywood	C	None			>6.0			20-40	Hard	High	Moderate.
Du: Dunning	D	Frequent	Brief	Dec-May	0-0.5	Apparent	Jan-Apr	>60		High	Moderate.
EdD, EfD3, EfE3: Eden.	C	None			>6.0			20-40	Rippable	Moderate	Low.
EkA: Elk	B	Rare			>6.0			>60		Moderate	Moderate.
EkB, EkC: Elk	B	None			>6.0			>60		Moderate	Moderate.
FrD, FrF: Fairmount	D	None			>6.0			10-20	Hard	Moderate	Low.
Rock outcrop.											
FwB, FwC, FyD: Faywood.	C	None			>6.0			20-40	Hard	High	Moderate.
La: Lawrence	C	Rare			1.0-2.0	Perched	Dec-Apr	>60		High	High.
Ln: Lindside	C	Frequent	Brief	Dec-May	1.5-3.0	Apparent	Dec-Apr	>60		Moderate	Low.
LoB, LoC: Lowell	C	None			>6.0			>40	Hard	High	Moderate.
LvC: Lowell Variant.	C	None			1.5-2.5	Perched	Jan-Apr	40-72	Rippable	High	Moderate.
LwB: Lowell Variant	C	None			1.5-2.5	Perched	Jan-Apr	40-72	Rippable	High	Moderate.
Nicholson	C	None			1.5-2.5	Perched	Jan-Apr	>60		High	Moderate.
MaA, MaB, MaC: Maury.	B	None			>6.0			>60		Moderate	Moderate.
McB, McC, McD: McAfee.	C	None			>6.0			20-40	Hard	High	Moderate.
Ne: Newark	C	Frequent	Brief	Dec-May	0.5-1.5	Apparent	Dec-May	>60		High	Low.
NfB: Nicholson	C	None			1.5-2.5	Perched	Jan-Apr	>60		High	Moderate.
No: Nolin	B	Frequent	Brief	Dec-May	3.0-6.0	Apparent	Feb-Mar	>60		Low	Moderate.
OtB: Otwell	C	Rare			1.5-2.5	Perched	Jan-Apr	>60		Moderate	High.

TABLE 16: Soil and water features—Continued

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth *(Ft)*	Kind	Months	Depth *(In)*	Hardness	Uncoated steel	Concrete
Pt: Pits. Dumps.											

TABLE 17: Classification of the soils

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Boonesboro [1]	Fine-loamy, mixed, mesic Fluventic Hapludolls
Cynthiana	Clayey, mixed, mesic Lithic Hapludalfs
Dunning	Fine, mixed, mesic Fluvaquentic Haplaquolls
Eden	Fine, mixed, mesic Typic Hapludalfs
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Fairmount	Clayey, mixed, mesic Lithic Hapludolls
Faywood	Fine, mixed, mesic Typic Hapludalfs
Lawrence	Fine-silty, mixed, mesic Aquic Fragiudalfs
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Lowell	Fine, mixed, mesic Typic Hapludalfs
Lowell Variant	Fine, mixed, mesic Aquic Hapludalfs
Maury	Fine, mixed, mesic Typic Paleudalfs
McAfee	Fine, mixed, mesic Mollic Hapludalfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs

[1] The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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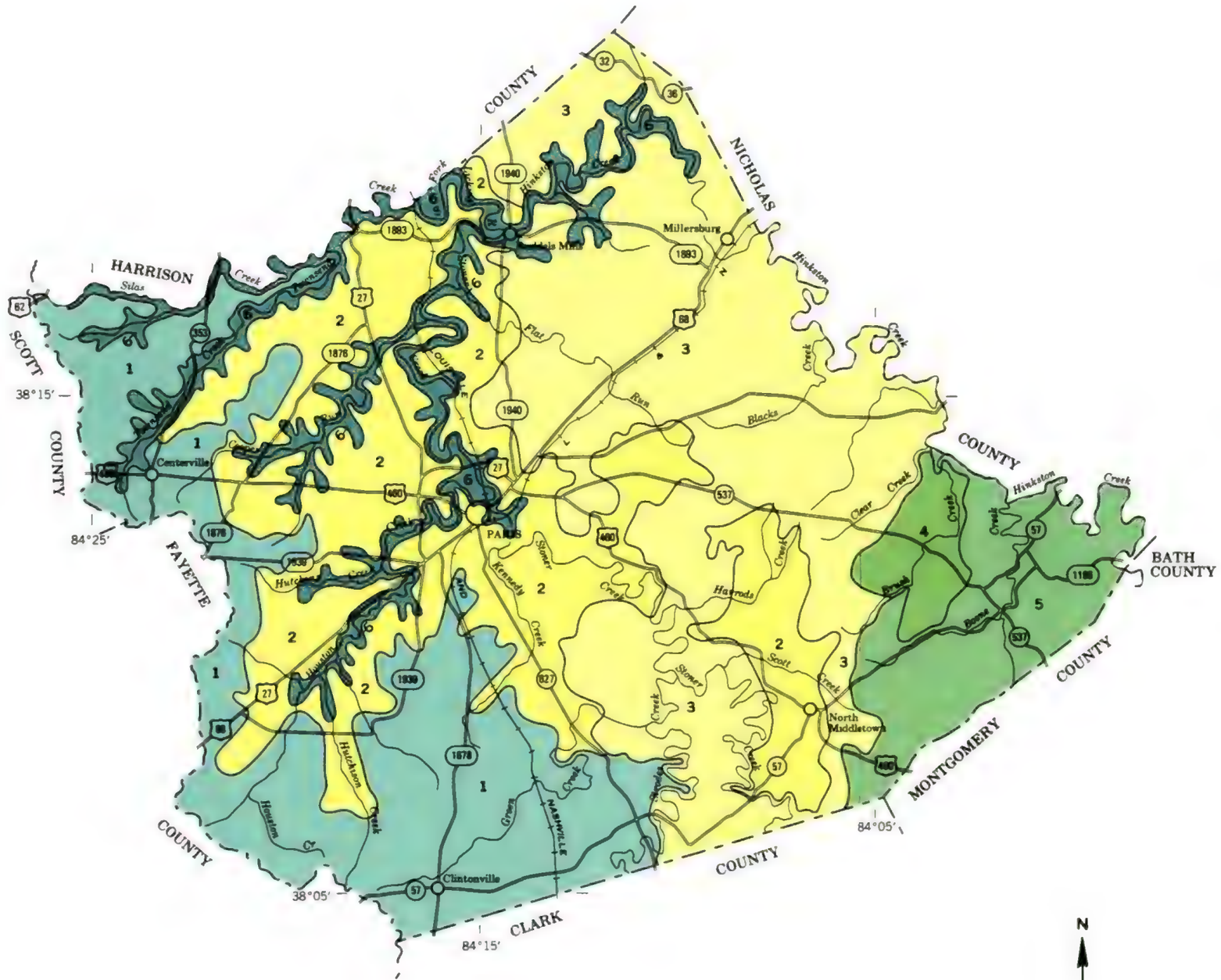


LEGEND

1 — LOWELL-FAYWOOD: Gently sloping to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

2 — MAURY-McAFEE-LOWELL: Nearly level to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

3 — LOWELL-FAYWOOD-CYNTHIANA: Gently sloping to steep, deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on ridges and hillsides

4 — FAYWOOD-McAFEE-CYNTHIANA: Dominantly sloping to steep, moderately deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on narrow ridges and hillsides

5 — FAYWOOD-EDEN-CYNTHIANA: Sloping to steep, moderately deep to shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil and in places a clayey and flaggy subsoil; on narrow ridges and hillsides

6 — NOLIN-ELK-LINDSIDE: Nearly level to sloping, deep, well drained to moderately well drained soils that have a loamy subsoil; on stream terraces and flood plains

Compiled 1982

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENTUCKY DEPARTMENT FOR NATURAL
RESOURCES AND ENVIRONMENTAL PROTECTION
KENTUCKY AGRICULTURAL EXPERIMENT STATION

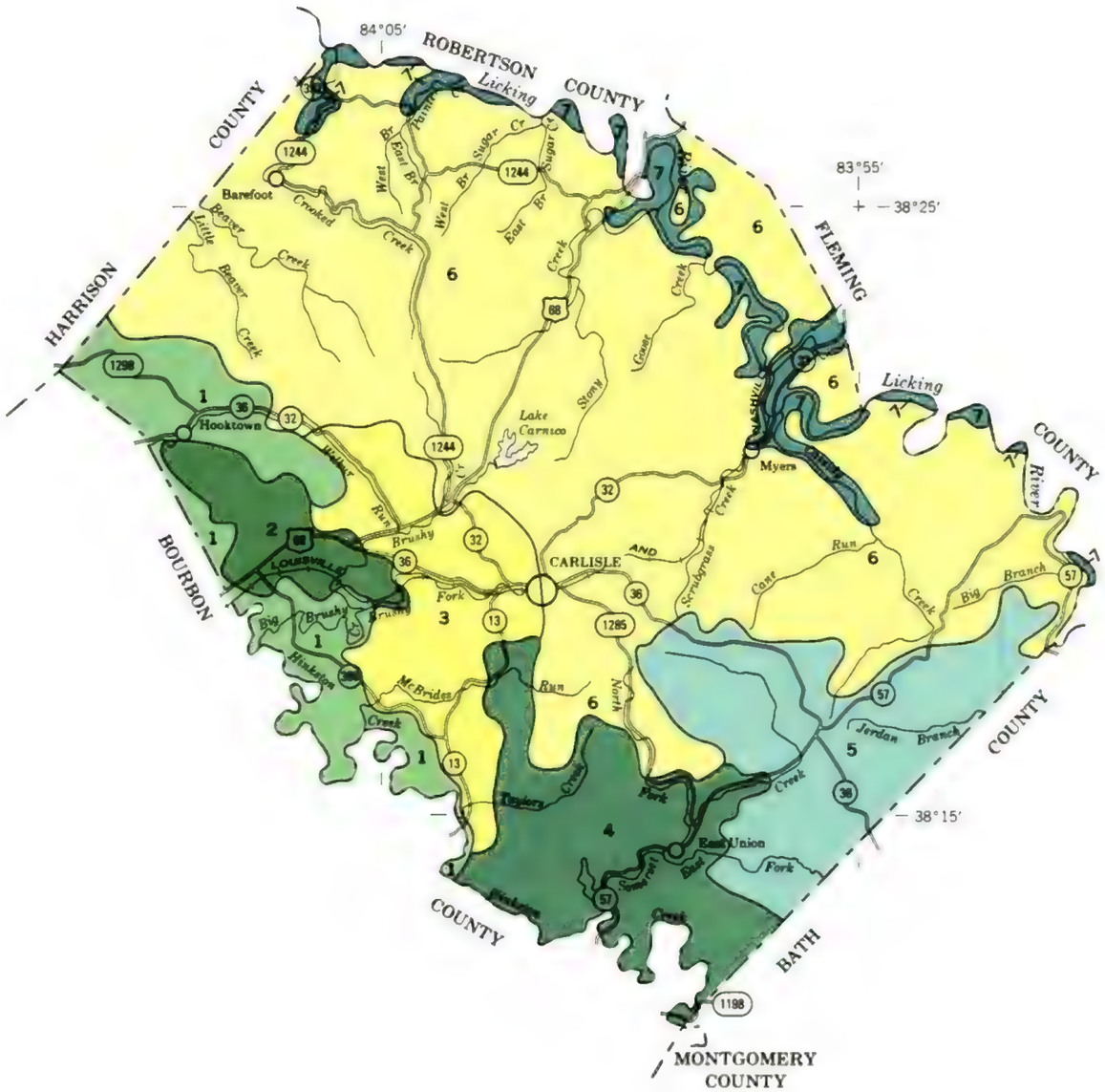
GENERAL SOIL MAP

BOURBON COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km



LEGEND

1 — FAYWOOD-LOWELL-CYNTHIANA: Gently sloping to steep, well drained to somewhat excessively drained, deep to shallow soils that have a dominantly clayey subsoil; on ridges and hillsides

2 — LOWELL-FAYWOOD-MAURY: Gently sloping to moderately steep, deep and moderately deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

3 — FAYWOOD-CYNTHIANA: Gently sloping to steep, well drained to somewhat excessively drained, moderately deep and shallow soils that have a dominantly clayey subsoil; on ridges and hillsides

4 — EDEN-FAYWOOD-CYNTHIANA: Sloping to steep, moderately deep and shallow, well drained to somewhat excessively drained soils that have a dominantly clayey subsoil; on long, narrow ridges and hillsides

5 — FAYWOOD-EDEN-LOWELL: Sloping to steep, moderately deep and deep, well drained soils that have a dominantly clayey subsoil; on ridges and hillsides

6 — EDEN: Sloping to steep, moderately deep, well drained soils that have a dominantly clayey and flaggy subsoil; on narrow ridges and hillsides

7 — NOLIN-ALLEGHENY-ELK: Nearly level to moderately steep, deep, well drained soils that have a loamy subsoil; on stream terraces and flood plains

Compiled 1982

N

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SOIL CONSERVATION SERVICE
KENTUCKY DEPARTMENT FOR NATURAL
RESOURCES AND ENVIRONMENTAL PROTECTION
KENTUCKY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

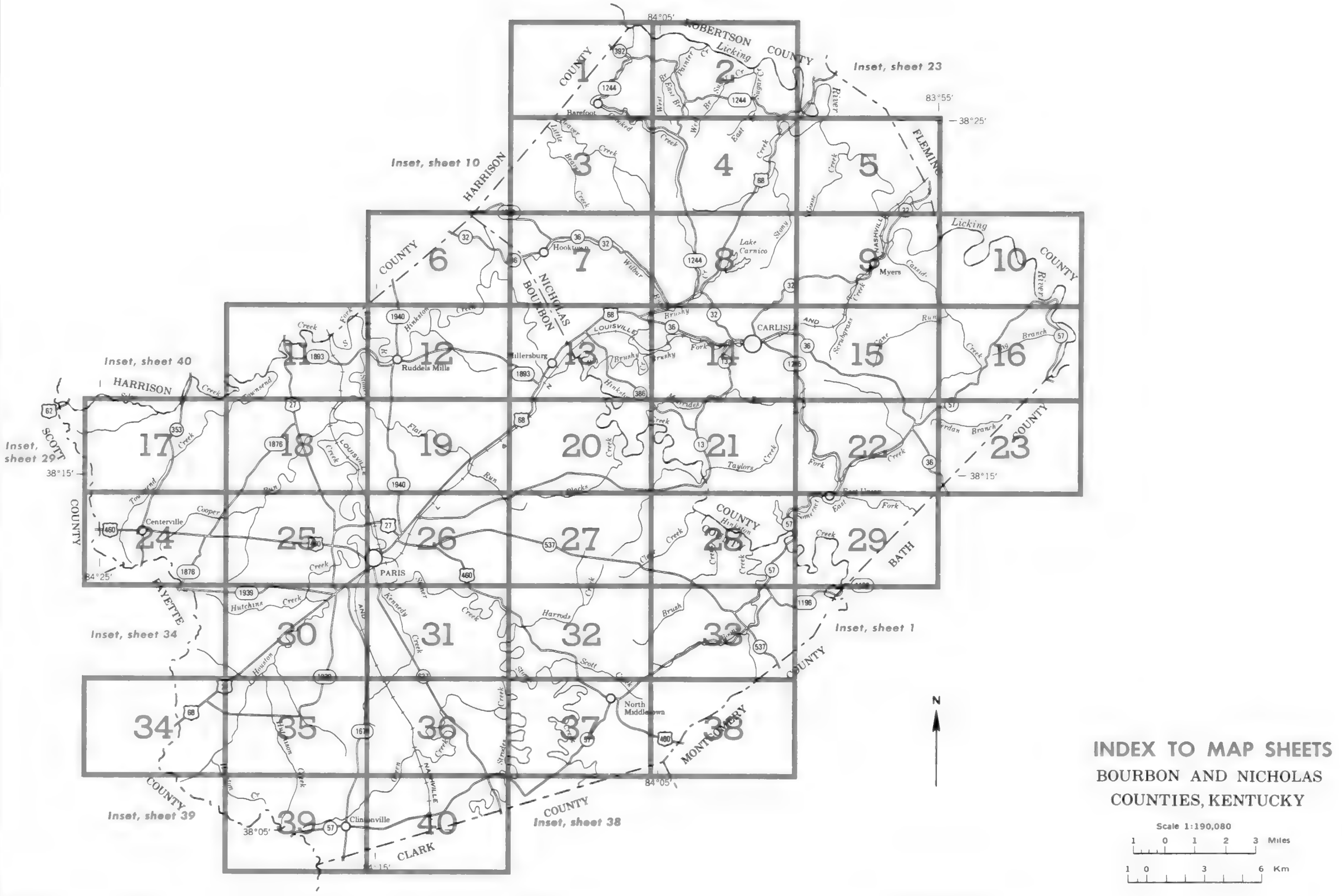
NICHOLAS COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.


84°05'
ROBERTSON COUNTY
Licking
Inset, sheet 23
83°55'
38°25'
Inset, sheet 10
HARRISON COUNTY
FLEMING
NICHOLAS
BOURBON COUNTY
Licking
COUNTY
Inset, sheet 40
HARRISON
SCOTT COUNTY
Inset, sheet 29
38°15'
Centerville
PARIS
Ruddels Mills
Millersburg
Hookstown
Lake Carnico
Myers
CARLISLE AND NICHOLAS COUNTY
LOUISVILLE
NASHVILLE
BATH
FAYETTE
Inset, sheet 34
Inset, sheet 1
Inset, sheet 39
Inset, sheet 38
MONTGOMERY COUNTY
North Middletown
Clintonville
CLARK
84°25'
38°05'
84°15'
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
N
INDEX TO MAP SHEETS
BOURBON AND NICHOLAS
COUNTIES, KENTUCKY
Scale 1:190,080
1 0 1 2 3 Miles
1 0 3 6 Km

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is used to identify separate mapping units that begin with the same first letter. The third letter, if used, is a capital and connotes slope class. Symbols without a slope letter are nearly level, except for Pits-Dumps complex which have little or no identifiable soil and variable slopes. A final number, 3, in the symbol shows that the soil is severely eroded

SYMBOL	NAME
AlB	Allegheny loam, 2 to 6 percent slopes
AlC	Allegheny loam, 6 to 12 percent slopes
AlD	Allegheny loam, 12 to 20 percent slopes
Bo	Boonesboro silt loam
CnD	Cynthiana-Faywood complex, very rocky, 6 to 20 percent slopes
CnE	Cynthiana-Faywood complex, very rocky, 20 to 35 percent slopes
Du	Dunning silty clay loam
EdD	Eden silty clay loam, 6 to 20 percent slopes
EfD3	Eden flaggy silty clay, 6 to 20 percent slopes, severely eroded
EfE3	Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded
EkA	Elk silt loam, 0 to 2 percent slopes
EkB	Elk silt loam, 2 to 6 percent slopes
EkC	Elk silt loam, 6 to 12 percent slopes
FrD	Fairmount-Rock outcrop complex, 12 to 30 percent slopes
FrF	Fairmount-Rock outcrop complex, 30 to 50 percent slopes
FwB	Faywood silt loam, 2 to 6 percent slopes
FwC	Faywood silt loam, 6 to 12 percent slopes
FyD	Faywood silty clay loam, 12 to 20 percent slopes
La	Lawrence silt loam
Ln	Lindside silt loam
LoB	Lowell silt loam, 2 to 6 percent slopes
LoC	Lowell silt loam, 6 to 12 percent slopes
LvC	Lowell Variant silt loam, 6 to 12 percent slopes
LwB	Lowell Variant-Nicholson complex, 2 to 6 percent slopes
MaA	Maury silt loam, 0 to 2 percent slopes
MaB	Maury silt loam, 2 to 6 percent slopes
MaC	Maury silt loam, 6 to 12 percent slopes
McB	McAfee silt loam, 2 to 6 percent slopes
McC	McAfee silt loam, 6 to 12 percent slopes
McD	McAfee silt loam, 12 to 20 percent slopes
Ne	Newark silt loam
NfB	Nicholson silt loam, 2 to 6 percent slopes
No	Nolin silt loam
OtB	Otwell silt loam, 2 to 6 percent slopes
Pt	Pits-Dumps complex

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

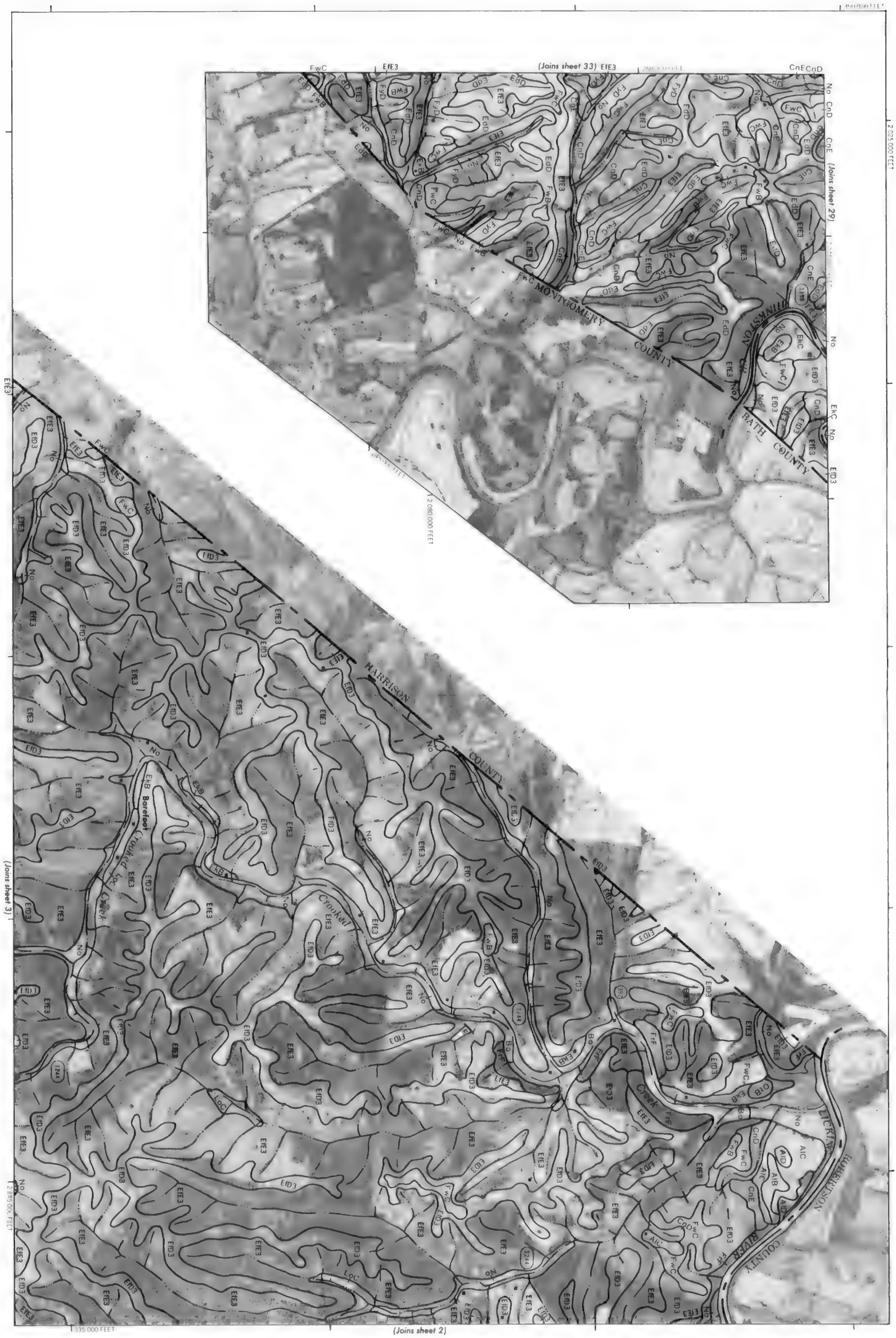
DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000

N

BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 1

BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 2

(2)

N

Scale - 1:20000

(Joins sheet 1)

(Joins sheet 4)

(Joins inset, sheet 23)

2 070 000 FEET

2 050 000 FEET

150 000 FEET

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BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 3

3

N

5000 Feet

1 Kilometer

Scale - 1:20000

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BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 4

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BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 5

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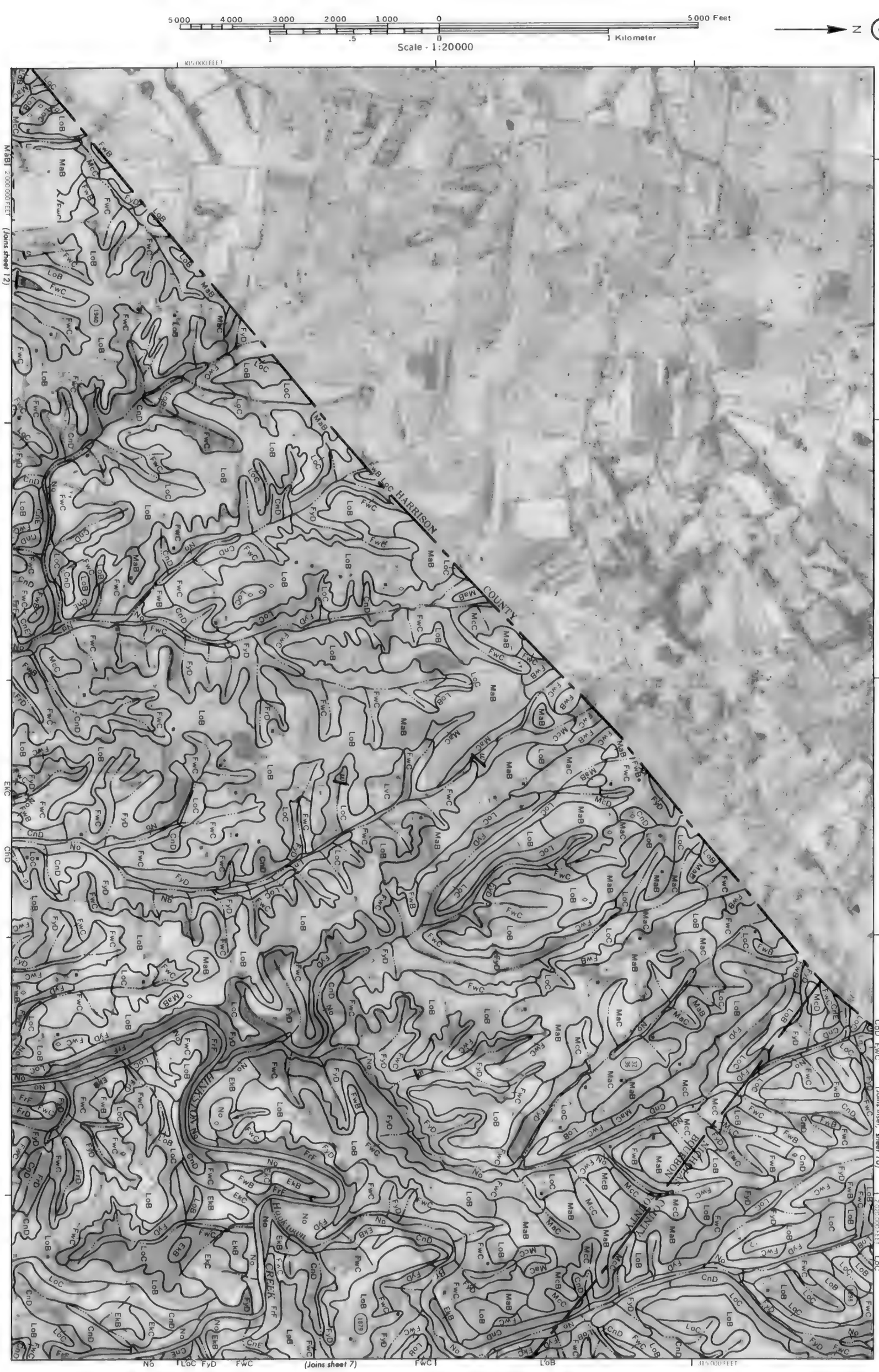
5

N

5,000 Feet

1 Kilometer

Scale - 1:20000



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10

N

5,000 Feet

1 Kilometer

Scale - 1:20000

2 120 000 FEET

2 022 000 FEET

315 000 FEET

325 000 FEET

320 000 FEET

2 017 000 FEET

2 100 000 FEET

FLEMING COUNTY

HARRISON COUNTY

LICKING RIVER

FLEMING COUNTY

Upper Blue Licks

Millersburg

Cassidy Trace

Fastrop Creek

1298

(Joins sheet 9)

(Joins sheet 3)

(Joins sheet 6)

(Joins sheet 16)

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BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 13

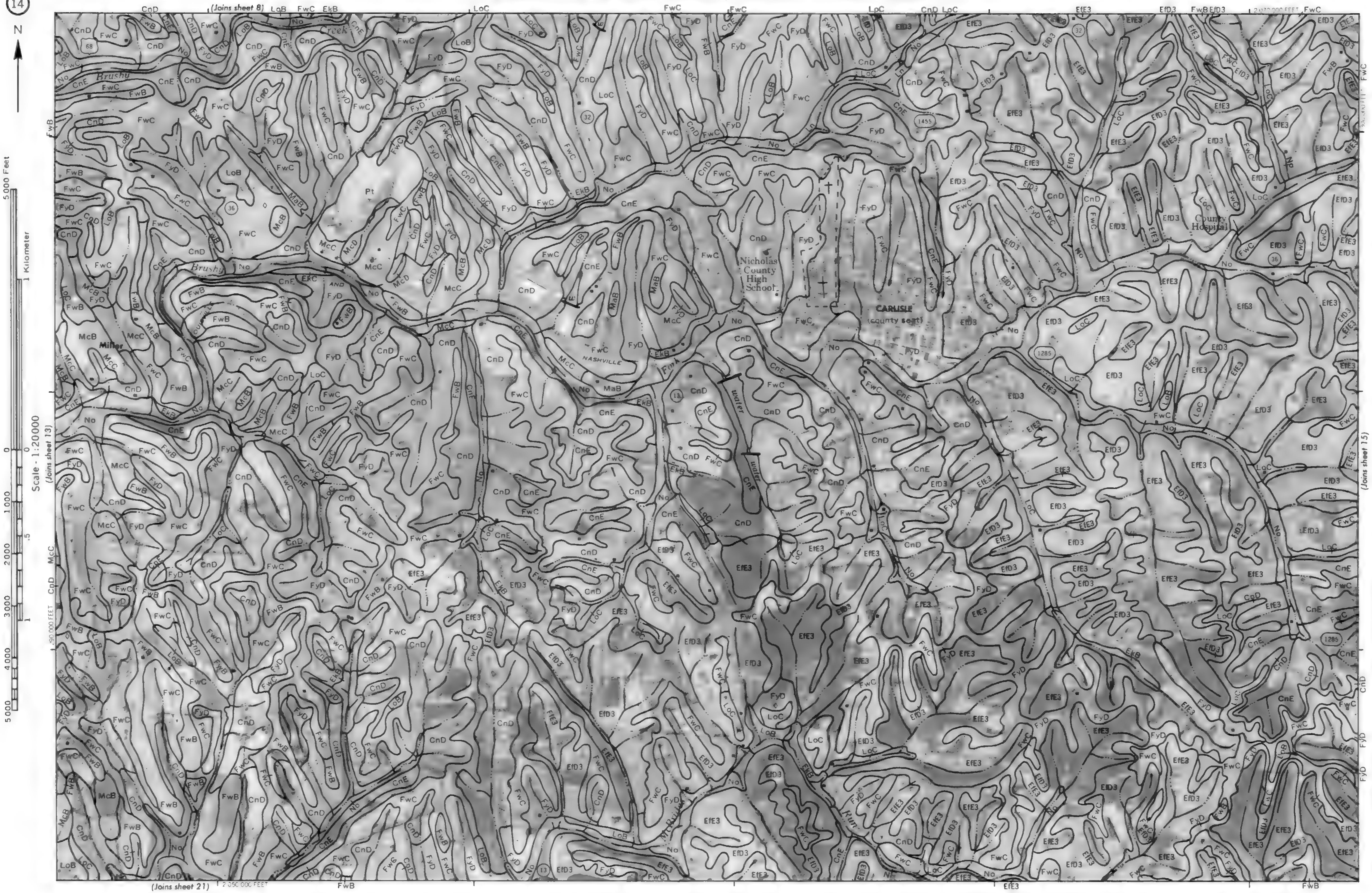
5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000

N

13



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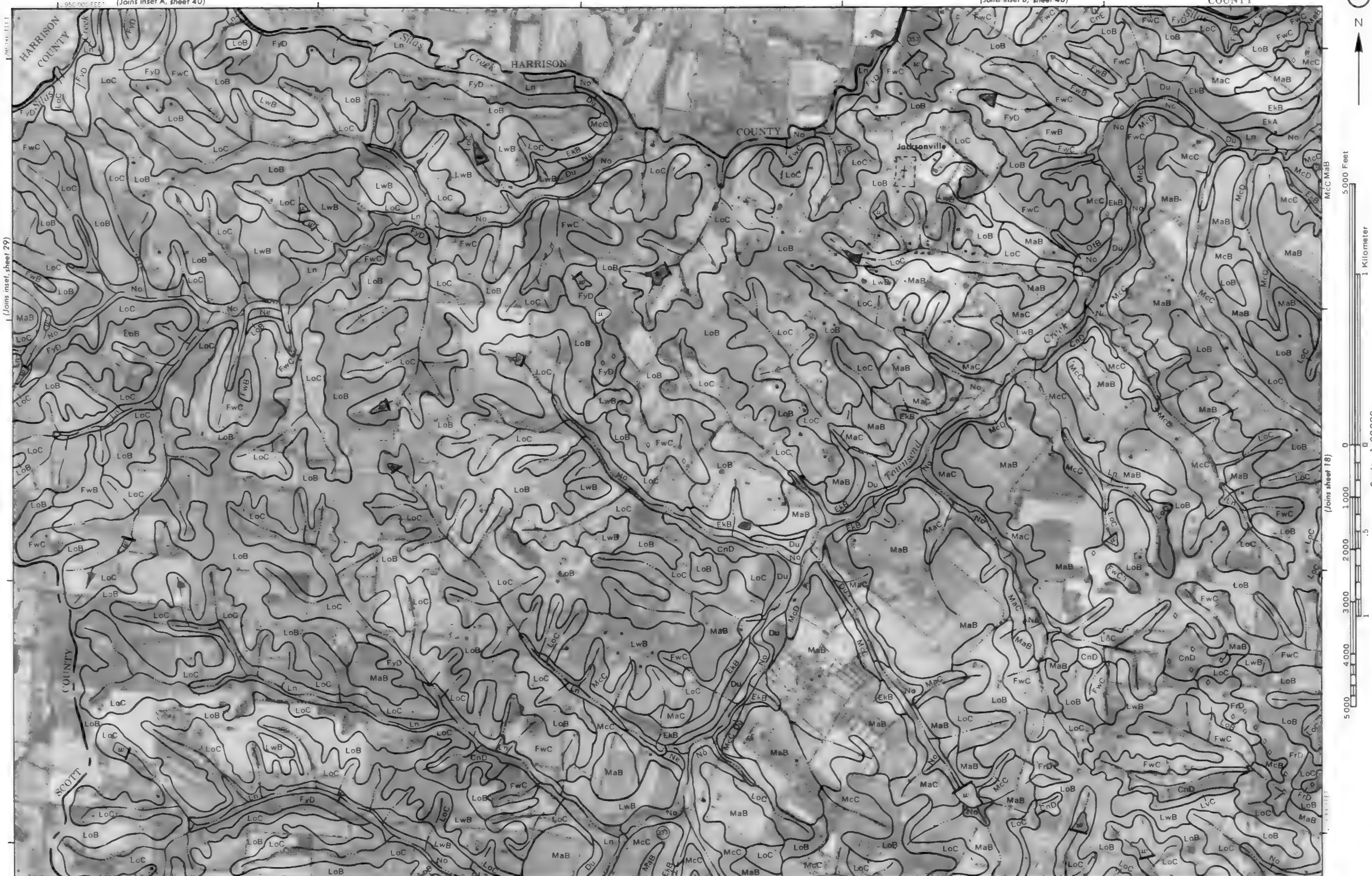
(Joins inset A, sheet 40) (Joins inset B, sheet 40)



(Joins inset, sheet 29) (Joins sheet 18) (Joins sheet 24)

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(Joins sheet 12)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 26)

N

5000 Feet

1 Kilometer

Scale - 1:20000

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(20)

N

Scale - 1:20000

5,000 Feet 0 1 Kilometer

0 1000 2000 3000 4000 5000

.5 1

(Joins sheet 19)

(Joins sheet 13)

(Joins sheet 21)

(Joins sheet 27)

2,045,000 FEET

2,025,000 FEET

Blacks Crossroads

Blacks Creek

HINKSTON CREEK

NICHOLASVILLE-BOURBON COUNTY BYPASS

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N

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5 000 Feet
1 Kilometer
Scale - 1:20000

22

N

Scale - 1:20000

5,000 Feet

1 Kilometer

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Moorefield

Summerset

East Union

Creek

North Fork

BATH COUNTY

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 29)

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(Joins sheet 24)
(Joins sheet 18)
(Joins sheet 26)
(Joins sheet 30)

25

N

Brentsville

Houston

PARIS
(county seat)

STONER CREEK

Cooper Run

Creek

5,000 Feet

1 Kilometer

Scale - 1:20000

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N

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(Joins sheet 26)

(Joins sheet 20)

(Joins sheet 28)

(Joins sheet 32)

5000 Feet

1 Kilometer

Scale - 1:20000

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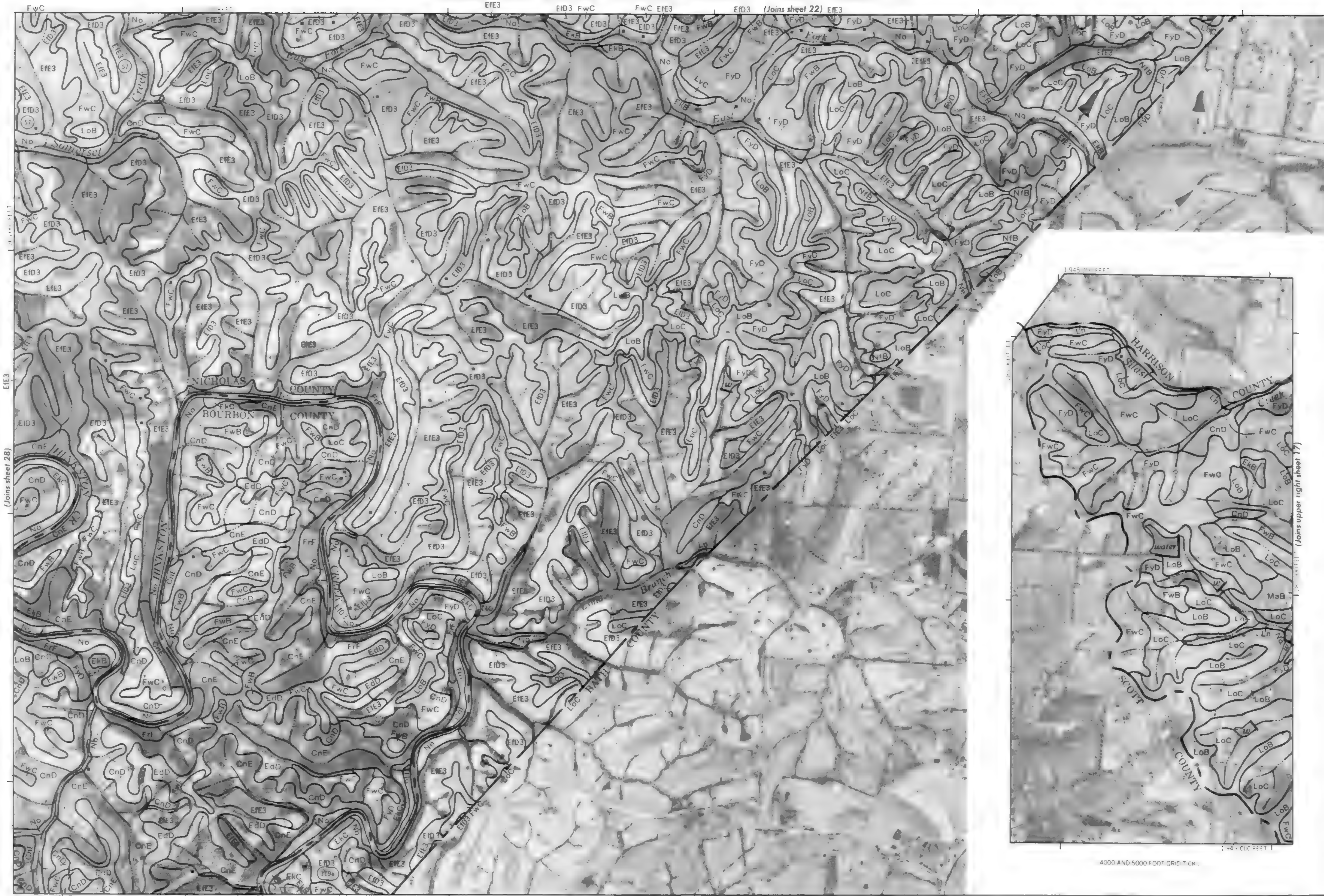

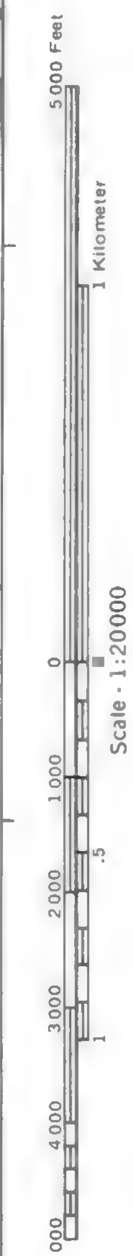

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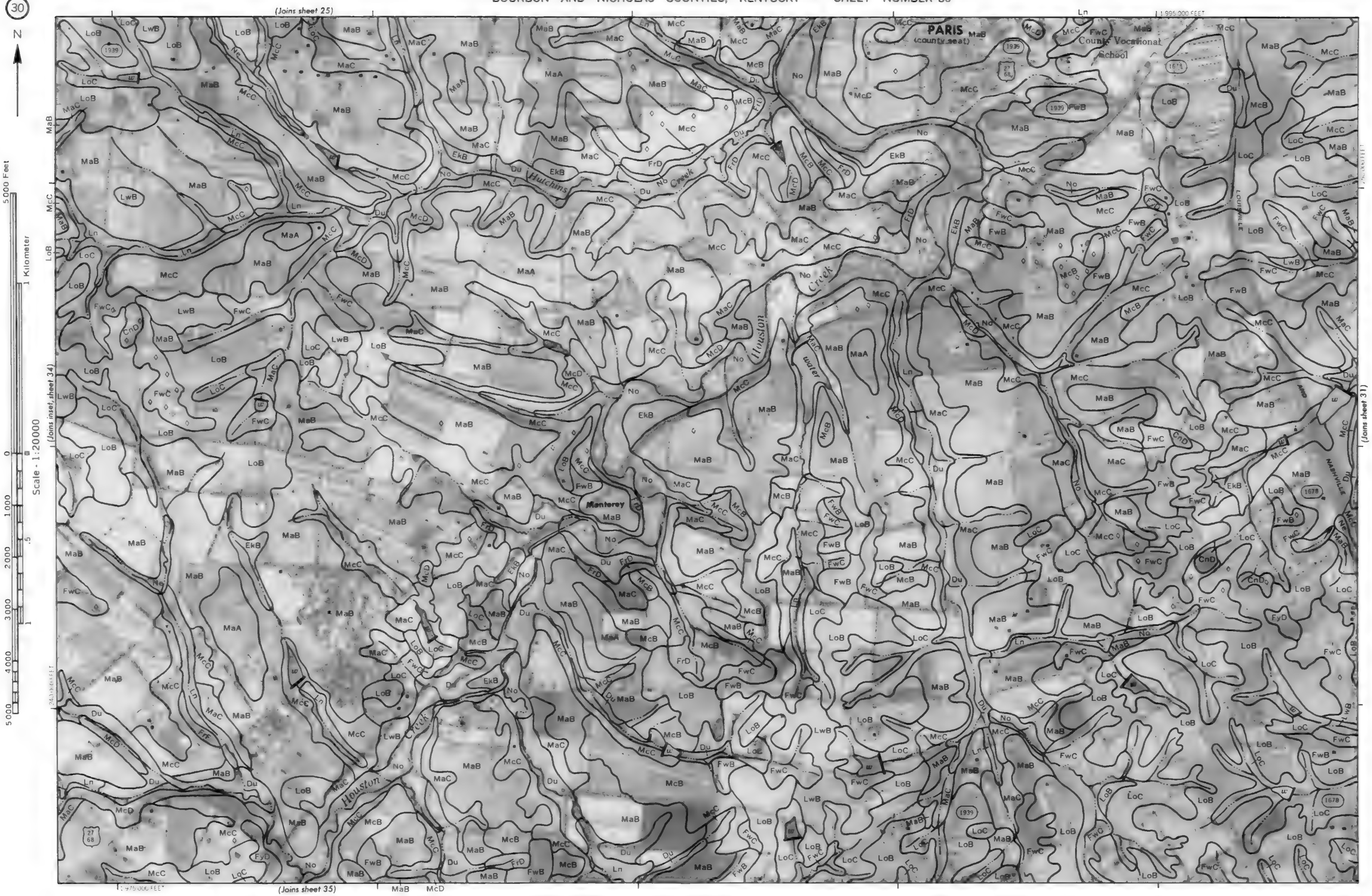

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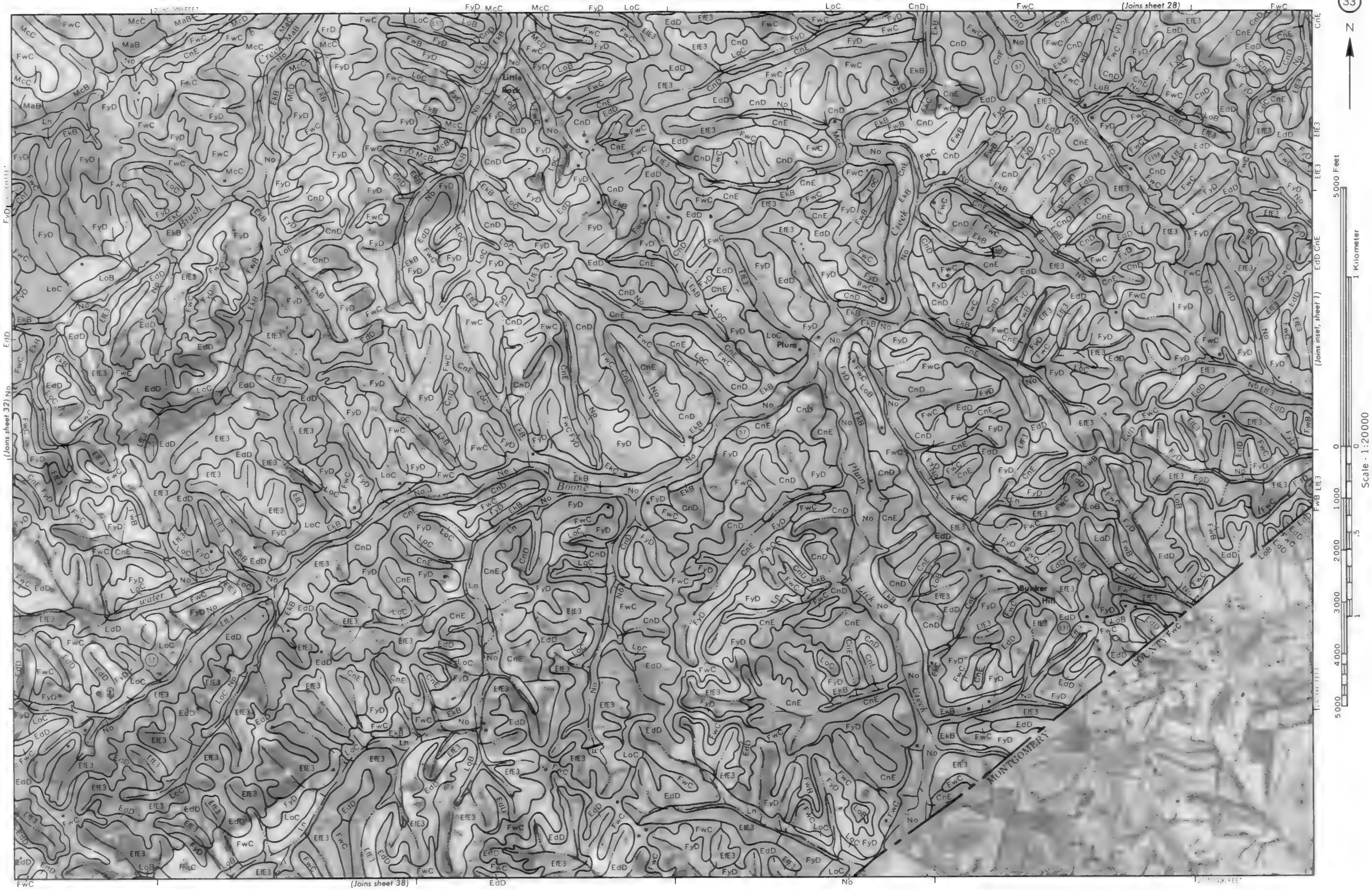

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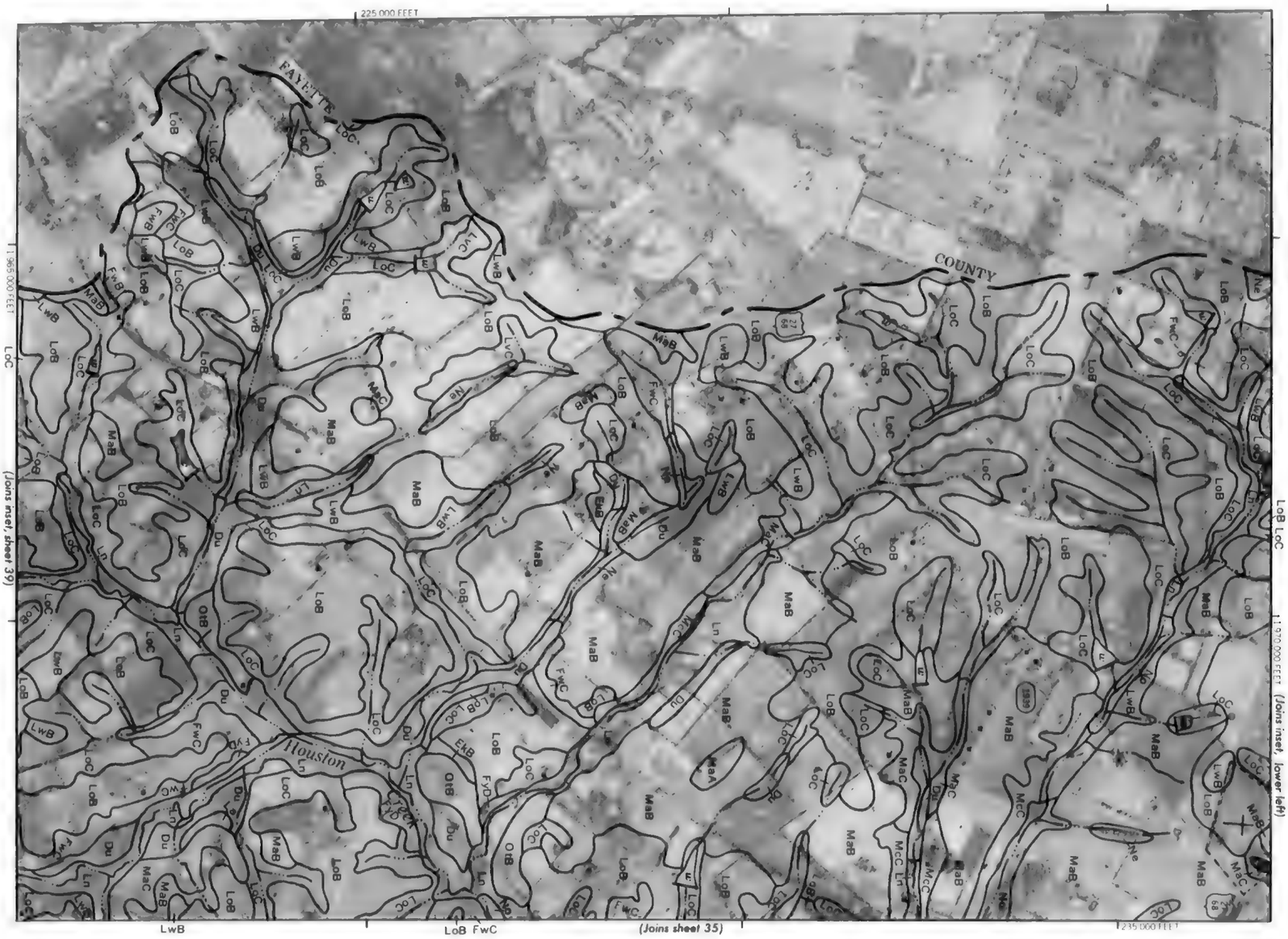
5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000

N

34



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(Joins sheet 36)
FyD (Joins sheet 32)
(Joins sheet 38)
FyD (Joins inset sheet 38)

2 025 000 FEET
2 045 000 FEET
1 225 000 FEET

North Middletown
Strodes Creek
Scott Creek
Indian Creek
Stoner Creek
Pretty Run
Donaldson Creek
COUNTY
CLARK

37
N

5 000 Feet
1 Kilometer
Scale - 1:20000

BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 38

(38)

N

Scale - 1:20000

1 Kilometer

5,000 Feet

(Joins sheet 33)

(Joins sheet 37)

(Joins sheet 40)

2 070 000 FEET

235 000 FEET

2 050 000 FEET

225 000 FEET

2 035 000 FEET

220 000 FEET

2 025 000 FEET

215 000 FEET

MONTGOMERY COUNTY

CLARK COUNTY

Indian Creek

Strodes Cr

No Pretty Run

Stoner Cr

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BOURBON AND NICHOLAS COUNTIES, KENTUCKY — SHEET NUMBER 39

40

N

Scale - 1:20000

1 Kilometer

5,000 Feet

2,000,000 FEET (Joins sheet 36)

220,000 FEET

(Joins sheet 39)

(Joins sheet 36)

Austerlitz

Strodes Cr

Johnson Cr

Green

Creek

water

COUNTY

CLARK

HARRISON

INSET A

1,953,000 FEET

289,000 FEET

286,000 FEET

1,950,000 FEET (Joins upper left sheet 17)

3000-FOOT GRID TICKS

INSET B

1,974,000 FEET

289,000 FEET

286,000 FEET

(Joins sheet 11)

1,969,000 FEET (Joins upper right sheet 17)

3000 AND 5000-FOOT GRID TICKS

205,000 FEET

2,020,000 FEET

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.